RESEARCH . . . . NIEUWLAND

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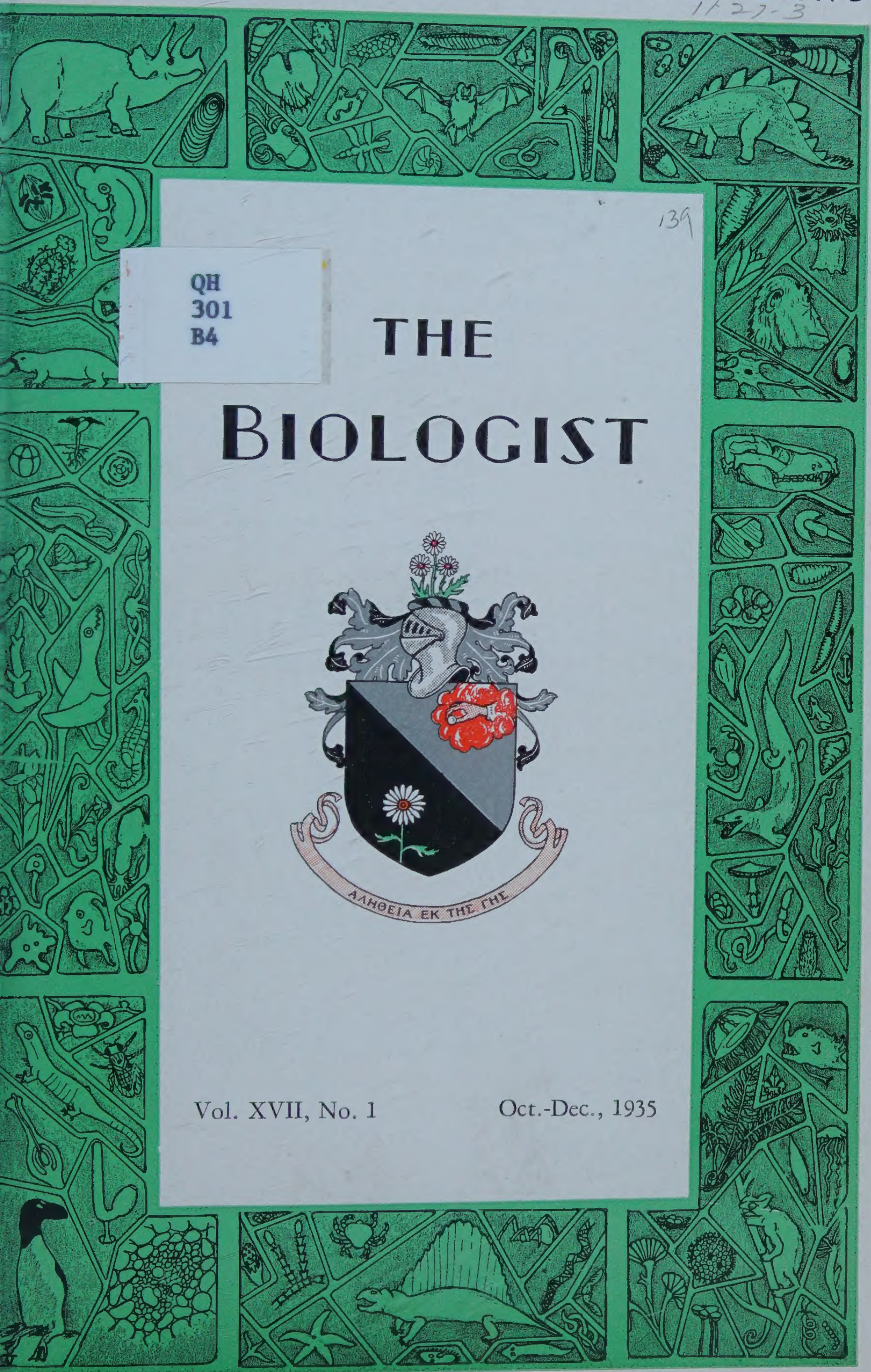

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THE BIOLOGIST

ΑΛΗΘΕΙΑ ΕΚ ΤΗΣ ΓΗΣ

Vol. XVII, No. 1 Oct.-Dec., 1935

CONVENTION NUMBER

PHI SIGMA
BIOLOGICAL HONOR SOCIETY

"The object of Phi Sigma is to promote interest in biological research. Although originally designated as an honorary biological research society, it should now be considered as a working guild of biologists interested in research. In effect, election to Phi Sigma should be an opportunity for better work, rather than merely election to an honorary society."

Mile Posts:

1915	March 17, Alpha Chapter organized, Ohio State University.
1916	May, Central Governing Body organized, BIOLOGIST first issued.
1917	June, last War-time BIOLOGIST issued.
1921	February, BIOLOGIST revived.
1924	December, First National Convention, Constitution revised, Washington, D. C.
1925	December, Second National Convention, First Scientific Program, Kansas City.
1926	December, Third National Convention, Second Science Program, Philadelphia.
1927	December, Third Science Program, Nashville.
1928	December, Fourth National Convention, Coat-of-Arms adopted, Fourth Science Program, New York.
1930	January, Council Meeting, Ritual Revised, Norman, Okla.
	December, Fifth National Convention, Fifth Science Program, Cleveland.
1931	Phi Sigma Letters Registered, U. S. Patent Office.
1932	December, Sixth Science Program, Atlantic City.
1933	June, Sixth National Convention, Seventh Science Program, Chicago.

Expansion:

The Constitution provides that: "An active chapter may be established in any institution of learning which requires for graduation the equivalent of four years of collegiate work, and which is equipped with facilities for research work. - - - - Any petitioning group must be active for at least one year before it may be granted a charter."

THE BIOLOGIST

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DIRECTORY

OF ALL ACTIVE AND INACTIVE CHAPTERS

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ALPHA

Ohio State University, Columbus, Ohio, founded March 17, 1915, (Inactive).

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University of Denver, Denver, Colorado, founded March 5, 1917.

ZETA

University of Wisconsin, Madison, Wisconsin, founded May 30, 1917.

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University of Akron, Akron, Ohio, founded April 20, 1921.

THETA

Michigan State College, East Lansing, Michigan, founded April 9, 1921.

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Washington University, St. Louis, Missouri, founded May 28, 1921.

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University of Kansas, Lawrence, Kansas, founded May 31, 1921.

LAMBDA

University of Montana, Missoula, Montana, founded May 4, 1921.

MU

University of California, Berkeley, California, founded April 27, 1922.

NU

Washington and Jefferson College, Washington, Pennsylvania, founded May 11, 1922.

XI

University of Nebraska, Lincoln, Nebraska, founded May 3, 1934.

OMICRON

University of North Dakota, Grand Forks, North Dakota, founded May 26, 1924, (Inactive).

PI

Emory University, Georgia, founded January 3, 1925.

RHO

University of Illinois, Urbana, Illinois, founded March 28, 1925.

SIGMA

University of Florida, Gainesville, Florida, founded December 4, 1925.

TAU

Duke University, Durham, North Carolina, founded March 4, 1926.

UPSILON

Miami University, Oxford, Ohio, founded May 7, 1926.

PHI

University of New Hampshire, Durham, New Hampshire, founded May 21, 1926.

CHI

Montana State College, Bozeman, Montana, founded February 11, 1927.

PSI

University of Washington, Seattle, Washington, founded April 7, 1928.

OMEGA

University of Oklahoma, Norman, Oklahoma, founded March 24, 1928.

ALPHA ALPHA

University of Southern California, Los Angeles, California, founded May 17, 1930.

ALPHA BETA

Mount Union College, Alliance, Ohio, founded May 17, 1928.

ALPHA GAMMA

University of South Dakota, Vermillion, South Dakota, founded May 15, 1928, (Inactive).

ALPHA DELTA

Lawrence College, Appleton, Wisconsin, founded March 7, 1929.

ALPHA EPSILON

University of Pittsburgh, Pittsburgh, Pennsylvania, founded March 23, 1929.

ALPHA ZETA

College of William and Mary, Williamsburg, Virginia, founded April 19, 1930.

ALPHA ETA

Oklahoma Agricultural and Mining College, Stillwater, Oklahoma, founded March 13, 1930.

ALPHA THETA

State College of Washington, Pullman, Washington, founded May, 1930.

ALPHA IOTA

Bucknell University, Lewisburg, Pennsylvania, founded January 9, 1932.

ALPHA KAPPA

Hunter College, New York City, founded January 8, 1932.

ALPHA LAMBDA

University of Utah, Salt Lake City, Utah, founded February 13, 1932.

ALPHA MU

University and State Agricultural College of Oregon, Eugene-Corvallis, Oregon, founded November 18, 1933.

ALPHA NU

University of New Mexico, Albuquerque, New Mexico, founded April 21, 1935.

ALPHA XI

Rhode Island State College, Kingston, Rhode Island, founded May 17, 1935.

WHO'S WHO

In This Issue

Rev. Julius A. Nieuwland, C.S.C.; "Research."

Dr. Nieuwland is an honorary member of Phi Sigma, in Nu Chapter 1922. He is professor of chemistry at Notre Dame University and combines in one man two very productive scientific careers. In his early years at Notre Dame he founded and for a long while edited "The American Midland Naturalist," a biological journal, which gave him free rein to exploit his hobby, plant taxonomy. Chemistry is his major field of scientific research. That he ranks highly among the world's wizards of the test tube and the retort is witnessed by his receiving the John Motley Morehead Medal of the National Acetylene Association in 1933, and the Gold Medal of the American Institute on February 7, 1935 "for a life-time of patient research devoted to new fields of organic synthesis based on acetylene to which he has made notable contributions." Finally, on April 22 of this year he was awarded the William H. Nichols Medal of the American Chemical Society. He is as much noted for his ability to inspire a research spirit in his students as for his discovery of duprene, synthetic rubber.

David Causey: "Individuality in the Animal Kingdom."

Dr. Causey's latest contribution to our pages will make him new friends who will learn to look for his articles in the magazines, even as do the rest of us who have become acquainted with him in past issues. Dr. Causey entered Phi Sigma in 1925 through Mu Chapter.

N. M. Grier: "The Biologist in the Liberal Arts College."

Dr. Norman MacDowell Grier is the zoological editor of "The American Midland Naturalist." He is a graduate of the University of Pittsburgh, receiving his Ph.D. there in 1919. He received active membership in Phi Sigma through Nu Chapter in 1922. He is a prolific writer in general biological fields, especially in their relations with education.

RESEARCH

REV. DR. J. A. NIEUWLAND, C. S. C. Nu '22
Chemistry Laboratory, Notre Dame University

LAZINESS is the mother of invention. Of course, what is meant is physical laziness, and not mental laziness. The latter, in fact, will make one less a man. One need hardly comment on this statement because the history of science shows too numerous cases where time and labor-saving devices resulted because someone was too lazy to do manual work, which, by the way is the cheapest commodity in the world. Otherwise, the "section gang" laborer would receive more wages than the "boss". The latter does the thinking; the former just moves dirt from hither to yon.

I have been asked times not a few what research is. I can think of no adequate answer than that it is just thinking applied to the solution of a problem. There are perhaps three forms of research. You may find them even among janitors. One will be able to sweep a room in three or four broom strokes less than the others. If you study his work, you will find that he does not do it quicker because his brush or broom is broader, but because his mind is. Another will do the work better in a given time, and he too must use more brains to obtain results. A third will be too lazy to handle a broom and will invent a machine to do the work. One must then do something quicker or better than someone else, or do something fundamentally new. In any case, brains are needed for the result. In fact, I should have said, rather, the use of the brains one has, for too many people assume they have none, and fail to use what they have. This is mental laziness and is most unforgiveable in a human being who is normally constituted to think as naturally as he is to eat and sleep.

At the dawn of the human race, some say the Pleistocene Age, the human male forced the women to do all the hand work because they thought they did some head work. Since women think, such a state of affairs could not last long. Next, animals were made to do the drudgery. Since animals needed someone to think for them they were in time found to be too inefficient. A horse, camel, elephant or ox is stronger than man, but man finally found that he can obtain more horse power from a small machine. Perhaps this is the reason no one smiles any longer when he sees a horse driven to market in a truck. Thus, the human race came from the Pleistocene Age to the Machine Age.

Not infrequently, teachers are asked what research is. It is really nothing but thinking and a human being can really hardly help thinking.

As I have just intimated, human progress and invention, and discovery usually result because man is too lazy to do manual muscular work, but when he becomes too lazy to think, then he falls to the level of the lower animals. The spirit of research in the normal human begins at the age of three or four. The child starts to ask questions and becomes, as some parents and teachers feel, a general nuisance. At 14, he finds that the questions he asked and for which he received no answers, probably could not be answered by his elders, and he naturally goes to books to find out. At 24, or earlier, he makes another discovery, namely, that the books cannot tell him what he wants to know; so he tries to find out for himself, by his own experiment or investigation. Now he has become a typical man of research, and the reason there are not more of his kind in this world is that the others had the spirit of original research spanked out of them at four for being a nuisance. Parents and teachers believe they are educating youth when they will not let them think, or will not admit that they themselves do not know. The greatest mind of the world does not know how a sunbeam helps to produce a bushel of corn from a few pints of plain water and some carbon dioxide gas, but they are trying to find out, and that is research.

Probably no living man or woman went through life without at some time grumbling about the fact that he had to work. No matter how much he likes his job, nearly everyone has an off-day occasionally when he fights it.

Voltaire said that work was the ideal protection against man's three big enemies—vice, want and tedium. No man can get into a lot of trouble if he is busy all the time, he probably will never be in actual want if he works all the time, and he never will be bored beyond endurance. Sifted down, that should make for a rather happy life, so perhaps work isn't such a bad thing after all.—The Staley Journal.

Boy: "Say, dad, what does it mean when the paper says some man went to a convention as a delegate-at-large?"

Dad: "It means his wife didn't go with him, son."

INDIVIDUALITY IN THE ANIMAL KINGDOM*

Dr. David Causey, Mu '25
University of Arkansas

WE meet today as individuals with a common interest, that of science in its many phases. We become acquainted, learn to recognize individual characteristics and perhaps eccentricities, see manifestations of varied personalities and form concepts of identity. According to the records, some of you attended the meetings of the Academy last year, and even the year before. May I, for the sake of my theme, and with no implied reflection upon the secretary, express my disbelief in those records? Is any member in the audience today actually the same person he was a year ago? We know so little about metabolism, but that little indicates most surely that each one of us is a center of intense metabolic activity—a center into which the various food stuffs are poured, rapidly worked over to extract their energy and building substances, and then almost as rapidly cast forth again. The great Huxley viewed this flux of matter as comparable to the whirlpool below Niagara Falls, a mass of whirling waters which has an identity and yet from second to second is never the same in actual substance. A tornado passing across the country would be a similar illustration of the great material turn-over each of us brings about. Popularly we are said to renew our physical composition every seven years. Most of us here have seen several such periods go by. And with that in mind I propose a first question about individuality—is any one of us the same individual as the babe born a number of years ago, the lad or lassie who grew to manhood or womanhood, the member of this Academy who attended the meetings last year or the year before?

Thomas Henry Huxley recognized two types of individuals. One, the zygotic or as it may be called, the Huxleyan individual, he defined as "the total product of a single impregnated ovum." His second type of individual, for which he suggested the term "zooid", is the functional type, an individual whose origin is by some non-sexual method—binary fission, budding, or the like.[1] Huxley's classification of individuals fails to cover all the difficulties which arise, and it is with some of these difficulties we are concerned.

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*Paper read before the Arkansas Academy of Sciences, Arts and Letters, Arkadelphia, April 19, 1935.

[1] The terms Huxleyan individual and functional individual will be recognized by zoologists trained at the University of California. Dr. Charles A. Kofoid used them in the first lecture I attended, over ten years ago. The present strange fruit would indicate that the seed he then planted had, to put it gently, a very slow germination period!

The simplest of the animals, the Protozoa, offer little difficulty as to what is an individual.[2] Obviously they are separate and distinct one-celled individuals carrying on all the activities essential to life. Typically they show little or no division of labor. The Metazoa or many celled animals give us an entirely different type of individuality. In these latter we find morphological differentiation of cells: germ layers, tissues, and organ systems. With this structural specialization comes the important physiological division of labor. No longer does a cell act as a tiny jack of all trades and none-too-good a master of any. Instead we find the great business of life divided into departments with specialists in digestion, excretion, reproduction and the like. With this morphological and physiological specialization animal life leaps forward, the ancestral home of life in the waters is abandoned and there comes the exploitation of the land and air as new habitats. We prefer to reason that this new, metazoan type of individual is superior to the protozoan type—we ourselves belong to it, and man, by repeated admissions, is the most superior of animals!

Is this Metazoan individual a clear and valid concept? Can we always feel certain of the individuality? Decidedly not. Many difficulties arise. First of all, the metazoan body is of two general sorts. One, divided into segments arranged in a linear series from head-end to tail-end is what we call a metameric type of body, while on the other hand is an equally important type which is not so divided and is termed non-metameric. The more primitive animals are of this non-metameric type, and we think that from this unsegmented form of body the metameric type arose. The Zooid theory of the origin of metamerism—of binary fission which failed to be carried to completion—leaves us with the possibility of regarding the metameric "individual" as one made up of a chain of individuals which were thwarted in their destinies—that regimentation and not individualism gained the day. Until we know more definitely just how metamerism first arose we cannot say what the metameric body is. We must leave it as an interesting mystery with no certain solution.

"Individuals" often form associations known as colonies. Protozoologists claim (botanists to the contrary) an interesting series of colonial forms which culminate in that fascinating little ball of life called *Volvox*.

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[2] One can readily create such difficulties. Accepting Huxley's distinction, one can argue that our lowly friend the amoeba, in which sexual reproduction has not been demonstrated, is a zooid and therefore a part of an individual which has sprawled out through countless geological ages, or it is a something which (if there was not even an initial sexual act at the beginning) has never achieved individuality!

In these forms we find associations which range from what appear to be merely friendly little groups of individuals enjoying one another's company, but with no apparent benefits, to colonies in which there is a slight division of labor. Certain cells alone become reproductive cells. How this is brought about is not known, about all we can say is that they differ in position in the colony.

Colonies of metazoan "individuals" give us greater difficulties. At the bottom of the metazoan scale are the sponges—a group in which the problem of what is the individual is merely one of its many unsolved problems. The collared and flagelated cell which appears to differ from certain protozoan cells only in lacking a stalk has been considered the individual, and in that case the sponges might be considered as colonial protozoa and not metazoa. The collection of a number of such collared cells in a chamber, of which a sponge may have many, has been held to be an individual. The most widely accepted interpretation is based on the Huxleyan individual—the result of the development of a fertilized egg, and expressed best by a simple form such as *Grantia*. More complex sponges reach their intricate forms only by first passing through this simple stage, with later budding or fission until the typical colony has formed.

The colony type of organization finds its best expression in the Coelenterata. The Huxleyan individual, coming from a fertilized egg, is clearly a *Hydra*-like animal. Then, by budding many additional "individuals" arise, and these latter trouble our concept of individuality a good deal. We say that the coelenterates show polymorphism, that they have different kinds of "individuals." In the simpler colonies two kinds of "individuals" are found—feeders and reproducers. One kind captures, devours and digests the food to maintain the colony, while the other kind devotes its energies to perpetuating the species. While the feeders can live a long time, perhaps indefinitely under ideal conditions, the reproductive forms are vital for the completion of the normal life cycle in the fluxuating environment which actually exists.

The Siphonophores, of which the Portuguese Man-of-War is a familiar example, carry this polymorphism to its fullest development among the Coelenterata. At least six kinds of individuals are known to occur in the colony: (1) the pneumatophore, or gas-filled float; (2) the hydrophyllia, or protective shields; (3) the nectocalyces, bell-shaped locomotor forms; (4) the gasterozooids, for ingulfing and digesting food; (5) the dactylozooids, long, tentacular forms with many nettling cells for protection and the capture of prey; and (6) the gonozooids, bell-shaped reproductive forms. The most vital test of an individual must be the ability to live, yet in this group we have a series of functional individuals mutually dependent upon one another for their very existence.

In the higher animal groups we find polymorphism appearing in a new form. In the colony type the polymorphic individual is an integral part of the whole, morphologically tied to the rest of the colony. In the social organization, however, such as exists among the insects, one finds morphologically distinct and separate individuals which can be picked up and examined without doing structural damage to the rest of the organization. That keenest of zoological thinkers, Dr. W. M. Wheeler, has discussed these social forms of insects in a variety of papers and books and we need scarcely do more than mention them. Suffice it to say, then, that in the termite society, for example, one finds reproductive individuals, the ''queens'' and ''kings'' as our textbooks usually call them, or ''reproductive slaves'' as others have as truthfully termed them; the workers, who are the Marthas of the insect world—poor virgins to whom the joys of reproduction are forever denied; and lastly the soldiers, likewise barren Amazons without the powers of procreation. The bees and ants offer comparable examples of this social organization with polymorphic individuals. We have here the most perplexing of individuality problems—a group of both Huxleyan and functional individuals,[3] none of whom is capable of maintaining the species without the help of the others. Only when a new social organization is to be established does the polymorphism fade away into a reproductive pair—a pair strangely suggestive in their function to the fertilized egg in other animal types. Shall we recognize, as does the poet Maeterlinck, a ''spirit of the hive'' which must be considered the true individual?

There are other groupings between animals, ranging from the loose and temporary associations such as a pack of wolves running down a steer to obligatory associations on the part of one or both of two distinct species of animals, or even of animal species and plant species. The termites and their intestinal protozoa offer an example of what appears to be an obligatory partnership, of what we call symbiosis. Defaunated termites sicken and die while eating their normal food; restoring the protozoan partners in time will save them. The protozoa are not found elsewhere than in the termite intestine. The interesting relation between the common *Yucca* and the *Yucca* moth is an example of such a relationship between a plant and an animal. Both are illustrations of mutual dependence and inability to carry out the complete life cycle without the presence of the other. Here, as in the hive, we seem at a loss in designating the individual.

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[3] My esteemed colleague, Prof. D. Y. Holcomb, objects to my considering the parthenogentically derived drone of the bee hive a "functional" individual. Aside from a constitutional reluctance to agree with a member of the weaker sex (however gifted), I submit that the significance of parthenogenesis is largely a matter of opinion and that it may be regarded as an example of a sexual reproduction. It certainly is not sexual reproduction as usually understood.

If you have had any experience in such matters, you are aware of the improbability, if not impossibility, of ever finding any one of the higher animals without its having one or many so-called parasites of one or many different species. I have seen a mouse stomach parasitized by a nematode worm, and the nematode worm parasitized by a protozoan. A common nematode worm living in the bladder of the rat has the male nematode as a parasite in the vagina of the female nematode. And one recalls Darwin's barnacles, females with one or more little husbands tucked away in as many pockets in the shells. What concept about individuality can cover such varied example of animal and plant associations?

Metagenesis brings up still more difficulties in our concept of the Metazoan individual. Doubtless most of you are familiar with the life cycles of the coelenterates and the trematodes. In the coelenterates there is a regular alternation between a hydroid form which reproduces by budding and a medusoid stage which reproduces sexually. Two generations, one sexual and the other asexual, are necessary to complete the normal cycle. In the trematoda from egg to egg one finds still more—a free swimming miracidium which transforms into a sporocyst in the snail's liver; then a redia, still in the snail liver, which in turn produces a free swimming cercaria which, with a bit of luck, will enter some vertebrate and become an adult fluke capable of laying eggs. I had considerable sympathy for a student who listened to such a description and then asked, "but which is the real animal?"

One last difficulty in our concept of the metazoan individual may be mentioned before we pass on to a different set of perplexities. All of us are familiar with the metamorphosis of animals—caterpillars turning into butterflies, tadpoles into frogs, etc. What, however, shall we say about the metamorphosis of the pilidium larva into the nemertean worm? Here a helmit-shaped larva with earflaps develops a sac around its own stomach, but of course, within its own body. Within this sac a nemertean worm grows, appropriates the stomach of the pilidium, and at the proper time breaks through the enclosing sac and goes on to newer and larger fields of life—leaving the poor stomach-less pilidium to swim about aimless and foodless until it dies of exhaustion. What a viper it nourishes in its own gastronomical bosom! And what in the world can one say as to individuality—would you call the pilidium larva an individual? So much specialized structure is left behind, abandoned, that one hesitates to consider it as approaching the insect metamorphosis.

Turning from the confusing concept of metazoan individuality proper to problems largely interpretative, we may consider some results of reproductive activity. Suppose we watch an amoeba—it moves about engulfing food and casting out its wastes until growth has lead it into what are mathematical difficulties. It has reached a size so great that its surface can't satisfy its volume, the one has been squared as the other has been cubed. The amoeba divides into what we call daughter amoebae. What has become of the mother amoeba? At best, all we can say is that there was a loss of identity, of individuality in such a reproduction. Budding, which is so similar to the preceding, may result in a temporary condition in which the two future individuals are so fused and confused as to leave individuality a matter of opinion unless we have actually watched the whole process. If the connection between the parent organism and the one forming from the bud persists we have the problem of colonial groups we have already discussed.

The conjugation of ciliates among the protozoa is more disturbing. Two paramoecia, for instance, come together and fuse in what we call conjugation. After a time two paramoecia separate. Are they the same individuals? Decidedly not. If time were available it could be shown that they are either the children or grandchildren of the original pair, and that when the whole process is over the resulting eight descendents of the original pair of conjugants are either the fourth or fifth filial generation.

Sexual reproduction has other perplexities to offer with respect to the matter of individuality. Are the germ cells, unfertilized eggs and spermatozoa, individuals? Probably not since the mingling of the materials of egg cell and sperm cell produce the fertilized egg which leads to the Huxleyan individual. But what, then, shall we say about unfertilized ova which develop parthenogenetically? It would appear that the unfertilized egg may be a potential individual as surely as is the fertilized egg. Examples of this are scattered throughout the animal kingdom—rotifers, various insects (bees, aphids), crustacea, etc.

The Huxleyan individual is "the total product of a single impregnated ovum." May we invert the statement and say that the single impregnated ovum leads to a Huxleyan individual? Not always, unless we can feel satisfied with Huxley"s concept of the zooid. Identical twins and the armadillo quadruplets are most certainly the products, respectively, of single, impregnated ova, and neither of a pair of identical twins could hope to escape a poll tax by such an argument. As zooids, in the

Huxleyan sense, the two together would, however, be a single individual. Twinning is not always clear cut—various grades of twinning are known. Perhaps you have known some one who for esthetic reasons had a deforming tumor removed. And perhaps an inquisitive surgeon dissected it to find that it was a parasitic twin! Yet that strange pair had for years fraudulently passed as an individual, had perhaps led some innocent woman into committing unconscious bigamy! I am not sufficiently versed in law to comment upon so grave a matter—I don't even know if a two headed man (a case of arrested twinning) would need to file one or two income reports.

Another difficulty about the Huxleyan individual is this. Suppose two such individuals, each derived from a fertilized egg, meet and fuse and then grow up as an apparently single individual. What do we have in such a case? The free swimming larvae of sponges are reported to do this. Somewhat similar is the fusion of the germinating but asexually derived gemmules of freshwater sponges, and the meeting and fusion of the plasmodia of the mycetozoa which our botanical friends are prone to consider as plants. And here we may mention in passing the bizarre results of grafting parts of animals together to form two-headed or two-tailed monsters and the like. From the viewpoint of individuality, what are they?

My last line of approach to the problem of individuality is that of regeneration. Suppose I have a planarian. I cut it into two, save the head end and throw away the tail end. In a few days, if I care for it properly, I have once more a whole worm, smaller to be sure, but complete. Obviously it is the same worm, recovering from a bit of mistreatment. Had I saved the tail end and thrown away the head end the result would have been the same. Which of course suggests that I save both halves, in which case I soon have two whole worms and the pressing questions—which is the old worm, and if neither is the old worm, where did it go to? Similar cases could be cited from the various animal groups—starfish, ascidians, coelenterates, etc.

If a sponge or coelenterate body is forced through the extremely fine meshes of a piece of bolting cloth the resulting fragments are often of only one or a very few cells. It is a remarkable fact that if such fragments are left in sea water they will go together in much the way the joint snake is reputed to do, and reform the original type of body. And even when the fragments of two different species of sponges are mixed they go back together to form the original species—they have an identity or individuality which holds true even in the merest fragments. Yet two masses of sponge debris of the same species would fail to demonstrate their individuality. Our very blood cells insist upon an individuality which goes so far as to divide mankind into at least four types or groups.

One last reference to regeneration and I am done—by properly cutting an animal body it is often possible to produce double heads or tails. It seems a matter of bringing about a partial isolation of the tissues and the doubling occurs. In such a case the results are very similar to the incomplete twinning already mentioned and may be fundamentally the same thing. Which doesn't add to our clear understanding of individuality in the least.

In concluding what has been necessarily a rather sketchy survey of the problem of individuality, in which many questions have been raised and none answered, I can do no better than quoting from Dr. W. M. Wheeler. He suggests seven types of organisms: (1) the Protozoan or protophyte; (2) the simple or non-metameric person; (3) the metameric person; (4) the colony of the nutritive type; (5) the colony of the reproductive type; (6) the coenobiose; and (7) the true or human society. He defines an organism as "a complex, definitely coordinated and therefore individualized system of activities, which are primarily directed to obtaining and assimilating substances from an environment, to producing other similar systems known as offspring, and to protecting the system itself and usually also its offspring from disturbances emanating from the environment. The three fundamental activities enumerated in this definition, namely nutrition, reproduction, and protection seem to have their conception in what we know, from exclusively subjective experience, as feelings of hunger, affection, and fear respectively."

There are two kinds of students who brag about their grades, those who make mostly A's and those who come up with flunks. . . .

It is necessary for the A student to describe how his high marks were made in order to avoid misconception that he might be an apple polisher. The flunkers must tell how they were discriminated against or else how little, after all, they really studied.

Strange as it seems, no one at the University will admit that he or she is just a trifle dumb. Those who find themselves up to their ears in flunks usually carry it off with a sophisticated shrug implying—"Boy, do I get around."—*The Daily Kansan.*

THE BIOLOGIST IN THE SMALL LIBERAL ARTS COLLEGE

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IN view of the tendency of the larger colleges to split into smaller administrative units, the possibilities of the small college appear to be of increasing importance. Personnel studies may therefore aid them in solving problems which have received inadequate attention in the past.

MORE JOB SPECIFICATIONS IN THE LIBERAL ARTS COLLEGE

Much has been written concerning the functions of the college president; somewhat less on those of its dean and registrar. Existing "job-specifications" for the college professor are terse. Quoting from the standards of the American Council on Education[1].

> "The training of the members of the faculty of professorial rank should include at least two years of study in their respective fields of teaching in a recognized graduate school. It is desirable that the training of a head of department should be equivalent to that required for a doctor's degree, or should re-represent a corresponding professional or technical training. A college should be judged in large part by the ratio which the number of persons of professorial rank with sound training, scholarly achievement, and successful experience as teachers bears to the total of the teaching staff."

Administrators new to the college world, and even those who are more experienced but somewhat handicapped by a limited scientific background, may not be aware of the full implications of the preceding statement so far as it may concern their department of biology. Hence it is the object of the author to interpret these recommendations in the light of over twenty years experience in the colleges, and of the professional opinion he has encountered during that time.

THE PLACE AND FUNCTION OF BIOLOGY IN THE LIBERAL ARTS CURRICULUM

Perhaps the greatest justification for liberal arts biology is in Bacon's assertion that the proper study of mankind is man himself, for to properly comprehend mankind is to understand from a scientific standpoint, the main principles relating to the form and function of plants and animals and their relationships. But liberal arts biology, besides enabling the student to grasp the trend of thought that has grown out of biological investigation, and which has influenced all departments of life and learning, is also preparatory to (1) graduate work looking forward to investigation; (2) teaching in secondary schools or higher institutions; (3) museum work, conservation, nature guide work, field biology; (4) horticulture, agronomy, landscape art, forestry; (5) medicine, nursing, laboratory technique, public health and sanitation. Some such statement as this should be in the catalogue of every college at the head of the courses offered in biology. The biological curriculum and its teaching facilities should adequately correspond to such a statement.

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[1] Ratcliffe, Ella B. "Accredited Higher Institutions, 1934." Bulletin, 1934, No. 16, United States Department Of The Interior. Office of Education, p. 7.

Medicine and dentistry as sciences are essentially biological, while the basic relationship of biology to the filial psychology and the social sciences seems plain. Additionally, incorporating as they do, much important data from Chemistry and Physics, the biological sciences can serve as one of the most important integrating factors in higher education. This viewpoint is usually found among biologists and has been suitably recognized at many institutions by a separate division of biological sciences in the curriculum.

IS BIOLOGY BEST ADMINISTERED AS PART OF A "SCIENCE DEPARTMENT"?

Despite such considerations as those presented, there is considerable evidence that instruction in biology at some institutions is not on a proportionate footing, and it is probably already evident that the task of the biologist, if well done, is both stimulating and exacting. In recent years there has been a tendency in some quarters to lump all of the sciences together for administrative purposes in one department, a practice of over fifty years ago. This has been recommended to facilitate supervisory practice in the small college, but such a procedure has never been advocated by those with first hand experience in the conditions which actually hold forth in these institutions, nor does it receive the approval of biologists or even scientists as a group. It is maintained that the work to be well done in any major science is so detailed as to be incapable of supervision by one experienced only in another discipline. Should this even be attempted, there is apt to be a decline or disproportionate growth in the department of the supervisor, while the opportunities for political manipulation are quite obvious. Emphatically, the liberal arts college should have a place for high type "personalities" on its teaching staff.

THE PREPARATION OF THE BIOLOGIST

With the requirements of the American Council on Education in view, it is recalled that in recent years the required period of study for the master's degree in science at outstanding institutions has been advanced to two years; that it may or may not involve research; that there is still a tendency to regard it as a teacher's degree or a convenient stopping place. Certainly the latter sentiment prevails in the case of secondary teachers. On the other hand, the Ph.D. degree may now require four years of graduate study. Recognized largely as a research degree, it correlates best with the ideals of "sound training and scholarly achievement". It is well to remember, however, that there are splendid teachers, also productive scientists, who for adequate reasons have had to forego the advantages of a well formulated Ph.D. course. If a college exists for the sake of its students, such teachers are preferable to Ph.D.s' who have gone to seed. However, it should be remembered that in appraising the background of a biologist without the doctor's degree, there is the difficulty of readily equating the value of his record and work in a time when a Ph.D. in the sciences is usually regarded as indispensable, but not always, for a professorship.

Frequently, Ph.D.'s are chosen not on account of their productive record since receiving their degrees, but to a large extent because the latter were obtained from a high ranking institution, and for the effect this fact may have when seen in the college catalogue. With respect to existing ratings of the various graduate schools, it is obvious that the influence of a particular institution should not extend beyond the initial appointment and salary, subsequent recognition to be conditioned by the type of service and productive work of the appointee. Certain graduate schools appear to be in active sympathy with this viewpoint, and it seems in place to quote at this point from the requirements of the Association of American Universities, a body whose major interest is in the preparation of students for graduate work. (I. loc. cit. p. 10)

> "In all cases, competence as a scholar and a teacher rather than the possession of degrees, will be considered as an essential characteristic of an acceptable member of a faculty."

Professors whose scholastic achievements have stopped with their master's degree are still called by presidents who are not convinced that productive scholarship is vital to good teaching. It may be felt that the extra energy of such teachers is best spent in various college or community activities which are thought to advance the college. Others consider such candidates more adaptable and therefore more reliable in the local situation, especially if the institution is financially weak. Local support and their alumni connection with the institution are frequently important factors and often detrimental ones in their selection. Special services they can render and regrettably, the necessity for weakening a department, are still others. It seems worth while to point out that this type of teacher may leave a very difficult type of situation for a more academically qualified successor, one which may require time and funds to correct. If at all possible, the biologist should visit the college before his appointment and clearly establish an understanding as to the support he feels he should subsequently have. The tension which results in colleges from the interplay of some of the factors which have been indicated, should be a matter of sincere concern to administrators of integrity.

Anomalies are occasionally noted with regard to the qualifications of the professor of biology, due in last analysis to a lack of understanding concerning the scope of this field. Until fairly recently, two men with graduate degrees in chemistry held the biologist's position for many years. One became known as a popularizer, albeit inaccurate of biological science, and in due time received an honorary degree in science from his *alma mater,* a small church related school. The other one managed to shove off a good deal of his teaching on his undergraduate student assistants who were his former students. Both developed situations which required several years for readjustment, and with injustice to their successors. Occasionally an M.D. is found to hold a professorship. Such of them who have developed broadening interests in the biological field, beyond the technical aspects represented by medicine and especially in the field of social science, should be regarded with approval as they can compensate to peculiar advantage in the training of premedical students, and may often render other services of importance to the administration. Many of the early naturalists were physicians, but here is recalled the case of a physician teacher uncovered by an educational survey. It appears that in his physiology course, he used a text of the vintage of 1890, passed on by one generation of students to another. His excuse was that no new bones had been discovered in the body since that date, and there was as much reliable information in it as the student could remember!

More specifically, what should be the background of the professor of biology in the small arts college? Evidently, on account of pre-professional requirements, his major subject is more advantageously zoology, whose sub-divisions are more closely concerned with the work of the first two years in medical and dental school than any other subject. Accordingly, it is also desirable that some graduate instruction be obtained in a medical school itself. In contrast with such preparation, a college president whose previous experience had been in public school work appointed as professor of biology a plant pathologist, a highly specialized subject which on account of its economic and research aspects is much better offered at a State University or Experiment Station. It also seems worth while to note that students usually like zoological instruction better than botany. However, the minor of the biologist is most advantageously in Botany, and should cover the full gamut of undergraduate courses in that field as well as some graduate ones if possible. Included should be Bacteriology, which is at times an excellent adjustment toward the vocational point of view in the liberal arts college. Exceptions to the foregoing viewpoints can of course be fairly taken.

Occasionally, courses in geology may be offered by the biology department, hence this subject and paleontology will also help in making up the background of the biologist. Additionally, it will be decidedly helpful if he has had courses in systematic zoology and botany, especially if there falls to his department, the task of creating or building up the demonstration collection, the departmental museum or herbarium. Much of this background in geology and systematics can be acquired independently as part of the teacher's professional growth, but absolutely essential for the teaching biologist is some summer work at the seaside biological laboratories, where a view of life is obtained which contrasts strongly with that received from preserved specimens. Additional advantages of these summer laboratories will be considered later. The preparation of the biologist should manifestly embrace courses in Genetics (Heredity) of plants and animals, including man, the latter being of significance in the curriculum as integrating with the social sciences. Obviously, the biologist in the small college should be well informed as to the vocations growing out of his field.

THE PREVIOUS TEACHING EXPERIENCE OF THE BIOLOGIST

Where the biologist is on his own responsibility for the first time, his teaching experience may have been gained as an under-graduate or graduate assistant at some other institution. The actual teaching conditions which have led many colleges to inaugurate a lower division of studies, indicate that the biologist could advantageously serve in secondary teaching for a short period before entering college work. Indeed many of our best teachers have had this very experience, and whatever the scheme of instruction followed at an institution, such experience is at least useful in sharply defining perspectives.

THE BIOLOGICAL CURRICULUM IN THE SMALL COLLEGE

In the small college, the biological staff is usually limited to a single professor and his assistants, graduate and undergraduate. Under such conditions, the botany courses offered are usually limited to two or three somewhat incidental one semester courses. While some small colleges still offer a range of biological subjects obviously beyond their facilities and staff, there is general agreement on most of the post-introductory courses—comparative anatomy, histology and microtechnique, embryology, heredity, bacteriology, teaching methods, and diverse special courses meeting the needs of students. Some biologists combine histology and microtechnique and mammalian anatomy in one course based on the cat. Special courses reflecting the particular background of the professor, such as Mammalogy, are highly commendable. Nature study or educational biology may be required by prospective teachers. Some of this instruction will ordinarily be offered in alternate years in order that the professor will not be overloaded for high grade work. Special courses should be very few in number.

Ordinarily the type of introductory course offered, though less frequently in recent years, is the survey course known as general biology. Composed of selected materials from chemistry and physics and the different divisions of zoology and botany, its textbooks are often classified as being of the ''shot-gun'' type. Various objections to the general biology course have led to separate semester courses in zoology and botany being offered, with the result that much available botanical material is not utilized. Even general biology texts, frequently written by zoologists, omit much balancing and interesting botanical data. Some reason exists for this in that students generally prefer the zoological side of the course to the botanical, but this preference may to some degree also reflect the viewpoint of the professor. Further reaction to the general biology course has led to the development of courses of the ''Animal Biology'' type, which are also intended to stimulate the student above the high school level of performance. Perhaps the latter type of course is of the most immediate use to purely pre-professional students. One views with sympathy, the pre-ministerial and pre-legal students who are compelled to wade through such technical instruction, although the use of such courses in institutions which can schedule separate sections for pre-medics is better justified. However, the medical profession has emphatically asked for more cultural courses rather than technical ones in the premedic's background, and this fact emphasizes the utility of the old general biology course. In the opinion of the writer, the latter is the introductory course best meeting the situation in the small college. At times, such an institution may schedule beside the regular lecture course in this subject, a lecture demonstration course which requires no laboratory work —sometimes termed "cultural biology". In the opinion of some, this would adequately serve the needs of general, pre-mininisterial and pre-legal students. If as seems possible, the students acquire as much *information* by this procedure, it should be remembered that *de facto* science instruction involves the handling of tools, and the student who does not obtain some practice in the accompanying technique may lose the inspiration and investigative faculty apt to be aroused by it. Obviously, introductory biological courses should take into consideration the background obtained by students in the secondary school. The high schools of the large cities have usually well trained teachers, and some of their courses are already on what may be conveniently termed a junior college level. Thus their students are better prepared to take advantage of courses of the "modern biology" type. Colleges in other sections must adjust their instruction accordingly, but definite standards should be set. Sometimes data obtained by the use of well known psychological tests, or ones which the biologist himself may devise, will be helpful in formulating a better knowledge of an instructional working basis.

FACILITIES FOR INSTRUCTION

The following comments are largely taken from the reports of committees of scientists who studied the situation in the Missouri colleges under the auspices of the University of Missouri. The writer has become convinced that they have a place in this discussion.

The biological laboratories should be located in well lighted quarters, not in basements and if in a science building with the other departments, usually below those of the chemistry department. Some feel that the dimensions of each room used for biological work should be much greater from east to west than from north to south. However, disadvantages as regards the light may be largely overcome by artificial illumination. All laboratories should be supplied with gas, water, and electricity.

In the construction of a new building which is to contain a laboratory, it is important to remember that the windows should be high, running nearly up to the ceiling; that the rooms should not be so deep from the windows in the north to the opposite wall on the south as to render it difficult for light to readily get across, and that the distance from the top of the window sills to the floor should be the same as the height of the laboratory tables. In horizontal measurement, the windows and the intervening spaces of brick and stone should be about equal in width. Therefore in horizontal measurement, the north front of the laboratory should be fully half glass. Too great care can not be exercised to secure perfect ventilation. Hoods to be effective must have forced draft and should be equipped with an electrically driven ventilating fan. The temperature should be kept uniform.

The class rooms for lectures and recitations should be near the laboratories so that apparatus and specimens may readily be transferred to and fro. Each room of this kind should contain a substantial demonstration table equipped with gas, water, electricity and provided with suitable drawers and cupboards. The room should contain a projection lantern and should be so curtained that it can be quickly darkened. On the other hand, many find daylight projection to be preferable. The lantern should be fitted for opaque, slide and microscopic projection and could be used by all departments requiring it. A motion picture machine is advantageous.

It is best to provide a separate lecture room for the biological sciences. It should have raised seats unless classes are handled in small sections; proper ventilation, good lights. Its other equipment has already been indicated. A room adjoining the lecture room will be found convenient for the proper housing of demonstration apparatus, charts, models, specimens or exhibits, or cases containing these may be conveniently placed in the lecture room. There should be at least separate laboratories for beginning and advanced students as well as an office—perhaps combining a private laboratory for the instructor, adjoining them. It is never desirable to use laboratories for lecture or class room purposes if that can be avoided.

Special care should be exercised in planning the laboratories. Provision should be made for the storage of apparatus and supplies by setting aside several small rooms conveniently located to serve as preparation and service rooms. Cases should be provided for demonstration apparatus, models, charts, microscopes and many other laboratory accessories. A good system of waste and drain pipes should be installed in such a way that repairs can be made without great expense. The aisle space between work tables must be adequate, and the work tables should be placed so as to afford students ready access to hoods, service tables reagent shelves, balances and other accessories intended for general use. The work tables should be of substantial construction, and should be provided with cupboards and drawers, possibly sinks, and outlets for water, gas and electricity.

To keep pace with the advance of science, new apparatus, models and specimens will have to be added to the equipment from time to time. Unless profits are derived from student fees and deposits, the cost of these acquisitions must be borne by appropriations from the general funds. The latter procedure in the opinion of the writer is most advisable. It is not easy to stipulate a definite sum which will be required to keep the laboratory practice and class room instruction up to date. The number of students enrolled and the variety of courses offered will form a basis for equable distribution of available funds among the science departments, but no department should be permitted to bid for students in a way which would merit professional censure. At all events, an item should appear annually in the college budget for additions to the equipment of the scientific laboratories.

It is not economy to buy cheap apparatus; all purchases of second hand equipment, especially microscopes, should be rigidly scrutinized. It is sinful to buy costly apparatus and then fail to provide proper housing for and care for it. Because of changes in the market from time to time, the biologist or business manager of the college should submit lists to various dealers for bids. In ordering, the desired quality can generally be obtained by specifying the number in the catalogue of some dealer. A good line of catalogues should be kept in the laboratory. In finally making up an order for the necessary materials, it is sometimes advantageous to ''split'' the bids.

Turning now from the initial investment for laboratories and additions to the equipment, to the annual turnover, we face the replacement of apparatus broken, materials and reagents used, and the deterioration of more or less permanent apparatus such as microscopes, ringstands etc. The cost of service for the proper dispensing of supplies must be included in the budget for scientific laboratories, along with the cost of water, gas, power, and repairs to laboratory equipment. This expense will be roughly proportionate to the amount of laboratory work required in each course. With two or three laboratory periods per week, the cost for breakages, supplies, service, repairs, deterioration etc. will vary somewhat for different courses, ranging from perhaps five dollars per student per semester in physics and certain biological courses, to at least ten dollars in chemistry. An annual outlay on this basis derived either from fees and deposits made by students, or from the general revenue must be included in the budget to cover operation and upkeep of the scientific laboratories. The expense of laboratory assistants is not covered by this estimate. The amount to be fairly charged as laboratory fees should be made the subject of special study by the teacher. This seems to have been done in very few cases.

It is desirable that a little money be invested in pictures for the walls and for exhibits in cabinets in the rooms and corridors. Sometimes the student biological society will make such gifts; in one case the students of each year's classes presented their key deposit money for this purpose. Pictures and exhibits give a distinctive atmosphere to each scientific laboratory. Many valuable exhibits, charts, etc., may be obtained from manufacturers for the asking.

Storage tanks lined with cement or of galvanized iron are necessary for keeping living animals. They should be easily accessible, if not kept in the laboratory room. A synoptic museum representing the phyla of the animal kingdom is a valuable adjunct which teachers should be encouraged to develop, and for which the necessary funds for jars, boxes and cases should be provided. Since charts are a valuable adjunct for teaching a beginning should be made with some good series which should be supplemented as the department grows. Paper, illustrating materials and drawing instruments will be needed for the making of charts, and also materials for making lantern slides. A dark room for photographic purposes may be shared by all of the science departments.

There should be a fire extinguisher and first aid kit, as well as a set of tools for the laboratory. A properly qualified teacher or student assistant can devise at small cost many articles of equipment represented in home made editions. The professor's time, however, is much too valuable for it to be used extensively this way. For instance, it is not felt that he should devote much time to the making of permanent microscopic slides, unless, for example, this is along his line of interest. Good microscopic slides may now be obtained very cheaply from the supply houses, and should be rapidly substituted for doubtful ones made by students or instructors, which frequently represent the accumulation of years. The institution should take out a permit for the purchase of alcohol in order that pure and adequate supplies of this reagent be accessable. A departmental bulletin board is very useful.

The laboratory and all of its furnishings should be kept bright and clean, the table tops receiving a scrubbing when necessary. A dismal sight is a biological laboratory littered with dirty, unused, or odoriferous aquaria. All materials should be removed from the top of the desks at the close of the day. If necessary, the departmental assistance can readily apply an acid proof finish to the tops of the desks, and this later may receive a dressing of linseed oil which can be polished to brightness. Certainly an index to the type of service rendered by a professor should be the clean cut appearance of his laboratory. Students and visitors are apt to associate a disorderly looking laboratory or office with the mental processes of the professor, and the former readily cooperate with the instructor in keeping things cleaned up if they see that it is the proper attitude.

Chemical solutions, stains etc. of which appreciable quantities will be used, should bear a permanent label on the bottle, giving the formula and proportions for making that particular quantity of the reagent. Such a label should be waterproofed with varnish or shellac, and reagent bottles in constant use should be likewise treated. This is only one of the many time saving devices the professor can legitimately develop.

The biologist should be encouraged to make plans toward bringing his department beyond merely an "approved" level as regards facilities and organization. Where this involves decided expense and on that account, opposition, it is sometimes helpful to submit the opinions of other scientific men in the matter. Supply houses will furnish lists of the equipment and materials needed to present a projected course, as well as the total cost of these. More textbooks should embody such lists. Tactfully worded appeals to trustees who appear to be sympathetic toward science or the progress of the college, or to officials of the controlling or affiliated church board of education may be of aid. If all such methods fail and there seems to be a discrimination against his department which he can not resolve or aid from any source, the biologist should cheerfully resign. The author has discussed many of the related problems in another publication.[2]

The biologist should keep an accurate inventory of all college property falling to his care, and on a plan followed also by the other science departments. Many of the so-called inventories in colleges are worthless for lack of sufficient detail as well as for neglect. A card catalogue system is perhaps most advantageous, and a copy of this inventory should be kept in the office of the business manager under fire-proof conditions. When the biologist comes to requisition certain chemicals and other supplies, he should first see whether he can obtain them from excess stocks carried in other departments. When that is the case, they should be charged against his department, and by this means considerable waste of funds may sometimes be avoided. New items for the inventory should be copied by assistants, after the invoices have been checked.

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[2] Grier, N. M. "On the Approval for Accreditment of College Scientific Laboratories". Science Education, Vol. XIX, No. 1, Feb. 1935, p. 1-5.

In many of the matters which have been discussed, it is regrettably true that biologists generally, as well as other scientific men have not been inclined to work collectively toward formulating standard requirements for teaching facilities, as well as for the other conditions under which they do their work, in contrast to the attitude observable in other disciplines. They face the probability of having these matters decided for them to an even greater extent by educational authorities of a limited background. The preceding suggests that there has probably been too great a degree of individuality in this field of college teaching. Certainly, science men have shown comparatively little interest as a group in pressing social problems of the time.

TEACHING METHODS AND TEACHING LOAD

There should be combined in biological instruction besides the usual lecture-laboratory procedure, the lecture demonstration method, class room discussions, and the socialized recitation method wherein a number of students present the materials discussed. Short, surprise written quizzes are usually efficacious; the technique of the oral quiz, if it is to get results, will require study for mastery. Both the essay and objective type of examination should find a place. An integrative and synthetic viewpoint should be present not only in the instruction, but also in the examinations. If term papers are called for, they should of course rise above the level of being copied from an encyclopedia, and should be graded on the basis of original thinking and investigative tendencies which may be apparent. Sometimes it is wise to assign a student to a project for personal investigation and report, such as the behavior of convenient animals and plants. Relationships with other science departments may well be such, that those professors can be induced to lecture occasionally in the biological courses making use of data from these fields. Similarly, when the background of these professors is evidently appropriate and other conditions favorable, they could even offer courses in biology such as ornithology, or the biologist might offer such a course as photography in the physics department.

When demonstrations are given, the apparatus should look bright and clean; the technique of demonstration or blackboard drawing should be practiced. If note taking is required, instructions as to this procedure should be issued to the students, while instructions on how to study will be useful if these are not provided through the observance of an orientation week. The occasional enrichment of the courses through the distribution of mimeographed material is usually advantageous. Of recent years, some biologists have formulated their own course in the form of a bound mimeographed volume in which the student may make his drawings. For obvious reasons, laboratory note-books when called in at the conclusion of the course, should not be returned to students until they have left the college. Laboratory or other notebooks may be used to furnish a variety of outlets for the student in a creative sense, but diagrammatic sketches rather than artistic drawings represent the minimum accomplishment in laboratory work; a lot of time is wasted by teachers who aid their students in making superior drawings. They should be permitted to find some things out for themselves. The librarian will cooperate by seeing that there is an adequate departmental library for the laboratory work, and in otherwise assisting the department to keep abreast of the times. Popular biological works of merit should be regularly acquired, even if their subject does not seem to have any important place in the curriculum. Leading scientific periodicals should be freely available to the student.

While the writer is much in sympathy with a decided tendency in the American liberal arts college toward adopting honors courses and conference methods of instruction, it is wise where these do not exist to systematize the courses as much as possible through posting a schedule of the contemplated work and assignments in advance both for the lectures and the laboratory work.

A certain amount of departmental rivalry is essential, but it should not occur under conditions whereby students may capitalize upon it for their own purposes.

A partial test of the efficiency of instruction given in a department, will be the records made in graduate and professional schools by the students who have majored in the department. Other indices to the type of work offered in a department have already been mentioned.

Personal traits which are basic to the popularity of professors among students, are useful in teaching only as they encourage the highest type of work. In one case, they may have an inspirational effect upon the student; in others, the impression given to an impartial observer may be the seeking of popularity at the expense of good standards. There are situations whereby relationships with students may be improved through a greater degree of social contact with them. The invitation of small groups to a professor's home is often decidedly helpful, but other opportunities exist whereby the better relationships may be fostered.

THE BIOLOGIST AND ACADEMIC FREEDOM

In recent years, departments of biology have been susceptible to attacks by anti-evolutionists, although such attacks have sometimes cloaked purely political motives. Even in an institution whose financial strength makes it more or less invulnerable to such attacks, it is important that evolution be presented as a *theory*, and as the one most acceptable to the scientist of background as being compatible with existing knowledge. It is of even greater importance from the standpoint of the truth seeker, that the biologist present evidence against the evolutionary theory from other scientific sources if he can, as well as from other fields of learning. In all matters apt to involve the teaching of evolution and other phases of academic freedom, the biologist should insist upon a clear understanding in writing before he accepts appointment, when in case of unjust treatment he may consider an appeal to the appropriate professional body.

TEACHING LOAD

Let it be emphasized further, that the best level of accomplishment of the duties described for the biologist will make heavy demands upon his time, especially in view of the somewhat arbitrary position taken in some quarters that 1½-2 hours in the laboratory shall be counted as the equivalent of one in the class room. Many biologists feel that an hour in the laboratory is more exhausting as regards teaching vitality than one in the classroom. Aside from the fact that the equivalent mentioned has undesirably introduced two levels of instruction in the sciences for both teacher and taught, and apart from its fairness and the method by which it was determined, graduate assistance for the laboratory sections is emphatically desirable. This will not only lighten the teaching load, but may make possible the addition of other courses in botany. It may also in some cases at least, incline the college to offer graduate work for the master's degree by way of additional opportunity for such assistants, and in possible compensation for their low salaries. While there are many criticisms directed against some of the colleges which are doing this very thing at the present time, it should be mentioned that there is also a noticeable trend, approved by some educators of prominence, for the senior college to offer work for the master's degree.

Generally speaking, the use of undergraduate assistants in teaching is unsatisfactory; they are usually inadvisable except for such matters of routine as collecting materials for classes, mounting specimens, technical work, etc. Such assistantships may be held out as prizes for the encouragement of students who are majoring in the department, and should be regarded as being in an apprenticeship relation. Such assistants should have mechanical or artistic ability, be able to typewrite, have completed a number of courses in chemistry, etc.

OTHER DUTIES OF THE BIOLOGIST

To the biologist will sometimes fall the custody of the museum collections of the college, some of which may be highly useful in the visual instruction given in his department. Sometimes he has served as curator of the entire college museum, but such a task unless it involves extra compensation should be shared by other colleagues in the nearest fields. Unless the biologist finds that it aids his own research work, he should not be expected to devote extra time to collecting trips to build up the museum. With capable direction of the students activities to be described, students will procure all of the specimens which can readily be cared for. Alumni, especially those residing in foreign countries may be encouraged through the college publications to forward others. Then the background indicated for the biologist will tend to insure their accurate identification and possible use. In the appropriations he requests, the biologist should also allow for the up-keep and development of his section of the museum, and will of course see that the library has the necessary publications to aid in the museum work.

The integrating function of the biological sciences in the liberal arts curriculum which has been mentioned, and the various interests which make up this account of the biologist's activities suggest a place for him on the following faculty committees—extra-curricular activities, library, buildings and grounds, graduate studies, etc.

THE BIOLOGIST AND STUDENT ACTIVITIES

In the writer's experience, student activities in connection with the biological courses are best handled informally in the smaller liberal arts college, although there is room for disagreement here. Officers, dues, too many formal programs etc., are rather reminiscent of the secondary school. The field trips to be discussed, and occasional, informal after laboratory periods of getting together for a good time; the introduction at such periods of competent speakers representing physicians, dentists and scientists who may present their researches will be ample. Biology has a rich supply of lyrics as represented in the Cold Spring Harbor and Woods Hole song books, and these may be used during the social time and even for instructional purposes.

Funds may be obtained either by the college or the biologist to establish scholarships at the various summer biological laboratories, for students who show a definite biological trend either for teaching or research. A good deal of museum material may be secured in this way.

Besides excursions into the open, field trips may include conservatories, zoological parks, public health laboratories, insane asylums, poor farms, etc., as inspection trips to these may be related to the work of the biological courses. Relationships may be established whereby these institutions may furnish the department with an appreciable amount of class and demonstration materials without cost. Field trips, however, invariably require extra time on the part of the professor and students alike and for that reason are apt to be avoided if at all possible. Perhaps the reason for this attitude may be apparent.

On account of the peculiarly close relationships which exist between biology and the medical sciences, it appears particularly desirable that such pre-professional students, as well as majors in biology, be placed in the biologist's advisory group. This has usually been the case in colleges, but not always.

THE RESEARCH AND PROFESSIONAL GROWTH OF THE BIOLOGIST

Some opportunities for research have already been indicated, as well as others whereby the professional growth of the biologist may be encouraged. Productive activity should stand approved in all faculty members as a source of professional refreshment. However, conditions may lead the professor to seek security or advancement by means of extensive faculty committee service; still other teachers are averse to any extra routine beyond that of their class work. As this situation works out, relatively few of the faculty may engage in any productive work. How much better for the spirit of research in the American liberal arts college if the routine could be equally shared!

Regardless of the location of the college and disadvantages it may seem to possess, there are opportunities for exercising the investigative spirit at any institution. For example, how many colleges have made a social survey of the particular region in which they have located, a project in which all of the faculty might participate? Research accomplished need not always be for outside publication; it may be distributed to some extent in mimeographed form, but should always obtain mention in the college publications. Fortunate is the teacher who can enliven his class room discussions with applicable accounts of his own researches, but few are the professors in the small liberal arts colleges who have been able to remain intellectually alert and productive. A recent paper[3] indicates that research in systematic zoology and botany has been more active in recent years than in most of the other divisions of biological science. Every college environment will permit of some research in these fields and in ecology as well. Should the biologist remain undiscouraged as regards research, and if he is unable to adapt along the lines indicated, other research may be attempted with the aid of small grants obtained from friends of the college, scientific societies, etc., while the necessary publications may be borrowed by the college library from larger ones.

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[3] Scott, G. G. "Distribution Of Papers In Biological Sciences For The Past Eight Years". Science, N. S., Vol. 81, p. 252, March 8, 1935. This paper is highly suggestive as to the trends in biological research.

A research journal composed of an old ledger may be used to record interesting facts encountered during instructional periods, such as variation in the structure of the materials dissected in the laboratory, and is an aid to the biologist in keeping alert. A biological calendar may be compiled giving the time of appearance of local species of flowers, birds, etc. Teaching devices, model, etc. which are constructed in the laboratory, together with other observations which seem worth while, should be reported to the appropriate professional magazines for which the librarian may have subscribed.

A wise administration will do everything in its power to preserve the advantages won for a college through the activity of professionally minded faculty. Hence if a department during the course of years has had a record of research associated with it, it is desirable that this tradition be maintained when a change occurs in the head of the department. Cases are known where inexperienced presidents have been misled through questionable motives to destroy such a tradition, through the appointment of professors who were neither qualified nor willing to maintain the worthy traditions of their predecessors.

The administration of a college may well find ways of aiding professors to spend additional summers at the biological laboratories in the field, when the biologist may jostle with his kind in a mutually stimulating way. Similarly, collecting and exploring trips involving a whole summer may be subsidized in whole or in part, and will aid in creating a desirable balance between the biology of the microscope and that of the wide world.

THE BIOLOGIST AND HIS EXTERNAL RELATIONSHIPS

High type administrators agree that the biologist be permitted to engage in outside activities for compensation, particularly if such work involves the well being of the college community, and if his teaching duties do not suffer as a consequence. Thus one professor made bacteriological analyses of the milk and water supply of the small town where his college was located.

The biologist becomes an additional asset to his college when he can lecture in public, participate in civic movements, in measures involving the conservation of natural resources. Sometimes such relationships have resulted in important gifts being made to the science work in the colleges. On the other hand, to preserve the freedom of choice of their faculty in such matters, some institutions have wisely placed in their catalogues, the statement that certain public services will be rendered for a moderate compensation. One biologist persuaded the local medical and dental societies to meet regularly at his laboratory. His students were accordingly benefitted. Unfortunately, many biologists in the past have lacked the social viewpoint to a large degree.

In some church related colleges, he may be active and consistently so, in church affairs, but for the sake of the mental hygiene involved, it would be better if he were not expected to teach on Sundays after teaching five days of the previous week. The biologist can and should make a valuable contribution to the college chapel exercises.

Contacts with fellow biologists should not be permitted to lapse, for more reasons than one. Sometimes the administration may wisely provide the funds whereby he may attend the scientific meetings. He may also represent his college in the State Academy of Science. He should certainly be identified with the leading professional society in his field—if a zoologist, the American Society of Zoologists, full membership in this group requiring research beyond the doctor's degree or its equivalent; if a botanist, the Botanical society of America. Membership in the American Association for the Advancement of Science and the American Association of University Professors is also helpful in promoting a healthy professional outlook. Salaries of course must be adequate if the biologist is expected to react in this manner.

THE FUTURE OF THE BIOLOGIST

Once the biologist has been found to meet the requirements described, he should be protected after a probationary appointment, and even during it, especially if there is reason to believe that special, non-educational interests of other faculty members are conspiring to make things uncomfortable for him. To be really worthy, he should retain legitimate ambitions in his profession. An excellent job accomplished as professor of biology in a small college,—but only if the authorities really know what they might expect in the best professional sense, should be considered superior preparation for a responsible position in a larger college or university. Supervision of the work of such a professor should become almost unnecessary.

Under certain circumstances, and it is hoped highly creditable ones, the biologist may find an outlet in administrative work as a dean or registrar, shifting his duties more and more to assistants but unfortunately often with a corresponding deterioration of the work of his department which is bound to effect the work of the entire college. To prevent this sort of thing and to also act in fairness to the biologist, or the professors in any other field, certain colleges have paid such outstanding men as much or even more than they could earn in an administrative position. Or a special post may be created along the lines of the professor's activity which will yield practically the same compensation. Such a post for the biologist might be the curatorship of the college museum. Finally, if a college can secure a biologist who can and will react as has been described, it must decide whether it will make him comfortable in his work or merely endeavor to exploit him with the idea that this is "good business". While the biologist himself, wherever he may be, is cautioned to do his job and keep on doing it in as big a way as possible.

THE AMATEUR BIOLOGIST

VICE-CHANCELLOR MELVILLE H. HATCH, Beta '18
University of Washington, Seattle, Washington

AS the several Phi Sigma chapters begin another year, I wonder if we could not devote a little attention to the encouragement of the amateur in biology. Early biology, especially in America, was carried on, in great measure, by amateurs. Then government took an interest in science, our institutions of higher education ceased to be almost exclusively classical seminaries, and the amateurs of one generation became the professionals of the next.

Now, our progressive mastery over power and the machine is giving us, collectively, a great new leisure, some of which some of us—more of us than ever before—are going to use in seeking a higher education. The professional biology of the schools will flourish as never before. Phi Sigma will find its position strengthened by the resulting increase in size of our departments of biology.

We will realize our opportunity incompletely if we rest content with such an achievement. Biology is both a profession and a hobby. Many successful biologists find it expedient to combine the two. But there should be uncounted thousands in this country to whom the opportunity of biology as a profession may never come who will find in it an endless source of avocational activity. In these present days of so much new leisure, the brotherhood of amateur biologists should again be an expanding one.

It is one of Phi Sigma's opportunities to father such a movement in the several college and university communities where it is situated.

OKLAHOMA'S BOTANICAL MURALS

Wilda M. Fritts
Secretary, Omega Chapter

ALONG with the various improvements in modern educational methods has come the use of visual instruction in the class room as a means of adequate and comprehensive learning. Such instruction, if applied artistically and scientifically, does much to add interest to any subject. This is especially true of laboratory courses in Biological Sciences where the interests of freshmen and sophomores are to be stimulated and directed.

It was as a result of such ideas that the Department of Botany at the University of Oklahoma has developed murals for its laboratories. The aim has been to combine art and science in such a way that the results would be artistic, yet scientifically sound. The original plan was to include the whole Plant Kingdom, grouping the plants as to natural habitats and thus placing those together that naturally occur together in nature.

The artist, Robert Shead, in seeking some method of constructing the murals, conceived the plan of arranging the plants of each mural of the non-vascular plants into four microscope fields. After this had been definitely accepted as an adequate arrangement, in that it made possible natural groupings, the artist varied the microscope fields in the lower plant groups, making some light and some dark. The arrangement into circles left the borders for symbols suggestive of related forms and fields of scientific interest. Here were added certain animals such as crab, snails, and Starfish.

One of the murals depicting the microscopic fungi is rather interesting in that the fields radiate out from the stage of a microscope in the rays of the spectrum. In each field, bacteria, slime molds, and other microfungi are accurately displayed. While the effect is decidedly modernistic, it is at the same time accurate and informative, as well as arresting.

The last mural completed depicts the Fern group and includes plants ranging from the smallest genera to the Tropical tree ferns. Subsequent panels will depict various types of seed plants selected with reference to their significance and interest in the panorama of plant life.

THE SARGASSO SEA*

By Dr. Anselm M. Keefe

Professor of Biology, St. Norbert College, West De Pere, Wis.

EVER since man first overcame his primitive superstitious awe of the bounding main and went down to the sea in venturesome ships, the ocean has been a stimulus to every imagination at all susceptible to the magic call of its waters. The inescapable glamor which surrounds all things maritime gives an importance to such rumors as the finding of a Phoenician galley, the raising of an imperial barge or the unearthing of a viking ship, which is entirely out of proportion to their scientific or historic value.

Certainly terms like "the Spanish Main," "the Isle of Spices," "treasure trove," "flotsam and jetsam" and "the Sargasso Sea" are a challenge to our imaginations. As usual, the less we know about them the easier it is to romance about them. Thus, shored up by fantasy, sea-legends have enjoyed longer credence than almost any other form of literary or folk tales.

Surely, of these none has laid longer claim to imagination and belief than the mysterious realm known as the Sargasso Sea. Old and new maps, even your radio globe, may still give it a localization and a name.

Let us see where it is. It lies in the North Atlantic Ocean about midway between Africa and Florida, at the center of an immense imaginary triangle, whose points would touch New York, Gibraltar and the mouth of the Amazon. At its eastern edge lie the Azores, the Canaries and the Cape Verde Islands, and at its western edge, Bermuda and the West Indies. As you will notice, it covers an area greater than that drained by the Mississippi River and all its tributaries—larger than Alaska, and, in fact, almost as large as the whole continent of Australia.

Around it, through the cold waters of the North Atlantic, courses the warm cyclonic circulation of the Gulf Stream, which, rising in the West Indies, swings northeast along the Atlantic states, then due east to the Spanish coast, then south to form the Canary current and finally, from Africa's Rio de Oro coast, as the north equatorial current, back to the West Indies islands again.[1]

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*A Science Service Radio Talk, presented on May 14, 1935, over the 42 stations of the Columbia Broadcasting System, and reprinted by special permission from The Scientific Monthly, August 1935.

[1] J. Murray and J. Hjordt, "Depths of the Ocean," p. 194, Macmillan, 1912.

Thus, by describing a great circle in the ocean, the Gulf Stream and its continuations in the North Atlantic form the boundary of an enormous eddy, which the German scientist Haeckel wished to regard as a "halistatic area." This is a term which you will not find in your dictionary or encyclopedia. It explains what Haeckel thought of the comparative changelessness of this portion of the ocean.

Owing to the fact that wreckage, and the usual driftwood borne by those parts of the Gulf Stream which are nearest this eddy, gradually float off into the Sargasso Sea, there arose a popular belief that its surface was studded with the derelict ships of all the centuries from the time of Columbus to recent years. They were furthermore supposed to be wedged together in an impenetrable mass of seaweed, which had likewise been swept into this eddy from the Gulf of Mexico and the Caribbean shores, where it originally grew.

This is just a tall story, however. Ships traveling from New York to the Guianas, to Brazil and to Africa, pass directly through the region. They do report occasional large masses of floating weeds, it is true, but no more than the usual number of derelict ships and wreckage which may be seen or expected anywhere else on the high seas.

The behavior of the drifting sea or—as it is commonly known—"gulf" weed is peculiar. At times the floating masses may come together to form great undulating golden yellow prairies. One mass has been reported to have been by actual measurement seven and one half miles long, and one half a mile wide.[2] It was so thick that sailors who set out to capture a hawksbill turtle sleeping in the tangle found their ship's boat inextricably caught, and they had to be hauled off by a rope from another boat.

Such heavy masses of the tangled seaweed are not always the case. Under the action of wind and waves they may break up into the long windrows familiar to seafaring people, which float in the ocean in parallel lines more or less evenly spaced, like the half-raked hay in a farmer's field. It is not surprising then that all reports regarding the nature and the amount of weed seen in the Sargasso Sea vary considerably. No one, however, denies the antiquity of their presence. Columbus encountered them and his sailors feared their diminutive vessels would be impeded by them. This is not hard to understand if we remember that the mats of growing weed may in some seasons become quite thick. At other seasons, however, they may be fairly thin, and in some cases they may even quite disappear, although this recurring disappearance and reappearance has not been satisfactorily explained, as we shall soon see.

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[2] *N. Y. Zoological Soc. Bulletin*, 28 : 3, 67, May, 1925.

There are only two well-known varieties of *Sargassum* floating on the open ocean. One form is more or less compact and bushy, the other more slender and delicate. Both have several easily distinguishable points in common with the related types of the weed which grow along our ocean shores. They are a much-branched, twiggy sort of plant, up to 18 or even 24 inches in height, with many golden green to greenish brown slender leaves. In the axils where the leafy outgrowths are attached, as well as along the stems, there are berry-like structures, filled with gas, which act as floats to support the plants in the water.

In the open ocean reproduction is purely vegetative, growth occurring, as it does in land plants, at the tips of the stems. The shore plant does not have roots, but when very young attaches itself to the rocky bottom by several fine outgrowths which later mature into a hard, woody, hold-fast. There are over one hundred of these various forms of attached *Sargassum* growing in more or less deep waters along ocean shores throughout the world. Such attached forms have both vegetative and sexual types of reproduction, but the latter characteristic is lost as soon as the plants themselves become detached or branches break off and float freely in the water. This is a fact one must remember, as it has a direct bearing on one of the challenging mysteries of modern botany and oceanography.

Students of animal life, zoologists and ecologists particularly, have discovered to their delight that the undulating masses of floating seaweed are inhabited by numerous forms which either grow attached to the plants or make their homes or hiding places in the spreading branches, safe from the attacks of larger and more powerful aquatic enemies.[3] The attached forms range from microscopic animals too minute for the naked eye, all the way up through the hydroids and moss animals to the mollusks. The free-swimming types which hide in the branching masses consist mainly of crabs, shrimp and many forms of fishes (especially the curious pipe-fish and the equally curious but better known seahorses).[4]

Perhaps the most fascinating scientifically of all the denizens of the sea-borne weed-masses are the recently discovered larval forms of the European and the American freshwater eels.[5] It is here that mature land eels migrate to meet, mate and die. It is here that the unusual young of both kinds are born, here they grow until they reach the "elver" stage, and from here they begin their long journeys through the trackless wastes of ocean back to the homes of their parents in the rivers and streams of Europe and America.

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[3] Wm. Beebe, "Galapagos," pp. 11-16. Putnam's, New York, 1924.
[4] W. Beebe, "Beneath Tropic Seas," p. 24. Putnam's, New York, 1928.
[5] W. Beebe, "The Arcturus Adventure," p. 22. Putnam's, New York, 1926.

Two theories have been proposed as an explanation for the vast mass of floating weeds on the Sargasso Sea.[6] One is that they are merely the plants that have been torn from their moorings along the West Indian coast and washed out to sea on the surface of the Gulf Stream. This is a very plausible theory, but like the report of Mark Twain's death, unfortunately for its credibility the ocean-borne varieties of *Sargassum* have not yet been found growing attached anywhere in the Gulf of Mexico or in the Caribbean Sea. Another puzzling fact is that a recently reported estimate placed the total weight of Sargasso Sea weed at ten million tons.[7] If only the parts detached from shore forms are supposed to contribute to this huge mass, there should be a much larger growth of *Sargassum* in our southern waters than has yet been detected.

The alternate theory explains the presence of the sea-borne weeds on the supposition that they have been present in the Sargasso Sea from primitive times and that by a process of vegetative growth they have continued to reproduce themselves through the ages. This theory is equally plausible, but the almost complete disappearance of the plant at some seasons still remains a natural mystery.

Of course, it may very well be that certain observations made on the famous "*Arcturus Adventure*" ten years ago really do corroborate another set of observations made by the Swedish naturalist Osbeck, nearly two hundred years previously. Osbeck noticed that the plants do not always grow at the surface. Part of the time they floated rather deeply submerged. Strangely enough, Dr. Beebe's log of the *Arcturus* mentions that on his return trip from the Galapagos about the middle of July that year much new weed was also discovered floating deeply submerged.

Dr. Beebe further mentions a fact, familiar to all who have studied the plant, that *Sargassum* remains fresh near the growing tips of its fronds, but that the older portions of the stems die, break off and disappear. It may very well be that in certain seasons, the older portion of the plants having sloughed off, the tips (on which the gas-filled floats have not been developed) sink into the colder subsurface waters and remain there until gradually the increasing numbers of newly developed floats bring them to surface again. This would account for the apparent seasonal disappearance of the bulk of the weed and its later reappearance.

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[6] G. Fowler and E. J. Allen, "Science of the Sea," p. 190. Clarendon Press, Oxford, 1928.
[7] *Science News Letter*, 26 : 713, 365, December 8, 1934.

Whatever the explanations that have been, or may be, offered, we may be sure that our knowledge of this fascinating oceanic problem is still in its infancy. It is one of the unsolved riddles of the high seas. Until it has been much more thoroughly studied out on the ocean, through every month and season of the year, it will remain another example of Mother Nature's mysteries—the part of those unanswered questions of our universe whose ultimate solutions are the not always so romantic duty and the province of biological science.

I have a few suggestions which ought to cut automobile accidents in this country down about 50 per cent over night—well, anyway, by the middle of next week.

My first suggestion to all motorists is: *Drive carefully enough for yourself and the other fellow too, because the chances are he isn't.*

My own system is to expect the world's prize idiot around every next corner.

When I turn a curve or go over the top of a hill, I hug my side of the road like glue and I slow down a bit, because I always picture a congenital imbecile at the wheel of a car coming at me from the other direction—a bird who was born on the wrong side of the road.

At an intersection, I always imagine the other intersecting artery filled with morons. And I slow down to offset their moronity with a double dose of my own sanity.

A little ordinary courtesy would help. We are usually peaceful in our attitude towards our fellow man, but the minute we get behind a steering wheel, we seem to regard every man as our enemy. The fact is we have killed more than 325,000 of our friends with motor cars in the last 15 years, whereas our enemies have killed only 300,000 of us in all our wars to date. —*Don Herold.*

Emerson declared: There is a time in every man's education when he arrives at the conviction that envy is ignorance; that imitation is suicide; that he must take himself for better or worse as his portion; that though the wide universe is full of good, no kernel of nourishing corn can come to him but through his toil bestowed on that plot of ground which is given to him to till.

COUNCIL NOTES

THE NATIONAL CHANCELLOR SPEAKS:

Fellow Members of Phi Sigma:

PHI SIGMA begins another year of work. Chapters are meeting. New officers are planning their programs so that each member may derive the maximum benefit from this year's work. Close contacts are being established everywhere between student and faculty and between student and student to the end that the primary purpose of each Phi Sigma chapter may best be accomplished. Phi Sigma was founded, not as an honorary biological society, but as a society which should devote its every energy to the promotion of interest in biological research. Phi Sigma members are not selected by the faculty as are the members of many honorary fraternities. Nor are they selected on the basis of scholastic attainment. The National Constitution calls for election of new members by vote of student and faculty members alike. Any student, graduate or undergraduate, who has successfully pursued a certain amount of college work including a certain specified amount of biology, whether he has made high grades or not, is eligible for membership provided he has demonstrated a *special capacity for research.*

In chapters where the members are largely or wholly graduate students, no difficulty arises in applying the research qualification. In chapters where juniors are elected to membership (and these chapters are now in the majority), the problem is a very real one. How can a chapter know, how can the wisest faculty member know whether a last year's sophomore shows any special research ability? If this were the basis for election in every chapter, and if each chapter failed to elect a new member until he had demonstrated a capacity for research, the undergraduate chapters would presently dwindle in membership to such infinitesimal proportions that their national dues would not pay the postage on this issue of the BIOLOGIST.

Obviously the constitutional requirement is not met. Chapters are doing their best under the circumstances. Some have prepared and adopted local by-laws which have no official standing in the fraternity but which do serve the purpose of providing local rules of conduct in these matters. In spite of the fact that there is no requirement whatever in the national constitution pertaining to scholastic standing, certain chapters have set up their own local scholastic requirements. Such chapters are in a very healthy condition. Is their solution the correct one? If Phi Sigma is primarily a research society, as the constitution states, is any chapter justified in selecting members on the basis of scholarship? If special research ability cannot be surely detected in a college sophomore should we try to detect *research promise* instead of demonstrated ability? Or shall we base election to membership on *interest in research*, which is a very different matter?

I suspect that the latter criterion is the one which is usually applied. If chapters meet once a month, as is required by the Constitution, that meeting must most frequently be devoted to a round table discussion of research done by others. These meetings in the graduate chapters certainly provide, in addition, a forum for the presentation of research done by the members themselves. Reports from many chapters indicate that many meetings are devoted to speeches by outsiders or by faculty members. All of this activity, it seems to me, contributes to the accomplishment of the purpose of the society—to promote interest in research.

In December we meet in St. Louis. Members of the fraternity from the four corners of the country will bring to St. Louis the results of their own researches and those of others in their local chapters. From the papers presented at Atlantic City and at Chicago it appears that many chapters are not only doing the things indicated above but are also actively promoting actual research among their members. The St. Louis meeting will be no exception. If your chapter is not represented by research papers other chapters will carry off all the laurels.

Send your delegate to St. Louis filled with ideas. Whether he brings a research paper or not have him properly instructed in matters of policy so that he may shine on the floor of the Convention. Hold a special meeting of your chapter to discuss the delegate's purpose in coming to the Convention. Load him up with ideas. Write out any proposals which you may want discussed at the Convention and, if possible, let Dr. Ortenburger know of them in advance so that arrangements may be made for their proper consideration. And by all means *send a delegate*. Your chapter is important. It must be represented. Your delegate will have a very remarkable experience and your chapter will profit by his enthusiasm when he returns.

Now may I offer you the warmest greetings from the National Council and express the hope that this may be the best and most profitable year of your experience. The worst is past. The air seems fresher, all of us breathe easier this fall than at any time in the past five years. Let us tackle all of our problems as though we meant to solve them.

Fraternally yours,
Paul A. Warren, *National Chancellor.*

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THE VICE-CHANCELLOR SPEAKS:

The forthcoming convention in St. Louis represents one of the most important of our society's activities, furnishing, as it does, a means of personal contact between the different chapters through the medium of their delegates. Each chapter should proceed with the selection of its delegate with the greatest concern. In every instance care should be exercised to see that the member chosen is one who is thoroughly interested in and familiar with the affairs of the chapter, one who will accurately, effectively, energetically, yet tactfully present its point of view, and one who can be relied upon to vote judiciously on all matters that may come before the meeting.

Melville H. Hatch, *Vice Chancellor,*
University of Washington, Seattle, Washington.

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THE NATIONAL SECRETARY SPEAKS:

The 1935 national convention of Phi Sigma will be held this year during the Christmas vacation, December 30, 31, and Jan. 1 at Saint Louis. The Warwick Hotel which is also the headquarters for the Section on Zoological Sciences of the American Association for the Advancement of Science will be our headquarters.

While all details of the meetings are not yet available we are planning a business meeting for Monday, December 30, and scientific sessions for the reading of papers, Tuesday, December 31. If additional time is required for either meeting January 1, Wednesday will be available.

The banquet which is given for all delegates and any other Phi Sigma members present who wish to attend will be held on the evening of January 1. A nationally prominent speaker for this occasion will be announced later.

Delegates

Each chapter is entitled to one delegate. Your chapter should elect this delegate and an alternate *at once*, if this has not already been done.

Railroad fare (only) of the delegate will be paid in advance by the National Treasurer. The delegate or his chapter must be prepared to pay other expenses, such as hotel bill and meals. It is, of course, understood that all national financial obligations of your chapter must be met *well in advance* of the convention date; if this is not done, representation will be denied. The delegate you have chosen should make reservations at once at the Warwick Hotel, in order that a room may be obtained before all of the less expensive ones are taken. Your delegate is, of course, free to choose any hotel he wishes, and some may wish to reserve a room in another hotel. The rates quoted are Single $2.00, double $3.00-$3.50. The location of the hotel is 1428 Locust.

CHAPTER REPORTS

Chapter reports must be brought to the meeting and turned over to the National Secretary by the delegate. It is expected that the chapter officers will co-operate in writing the report. The chapter report is to include all of the more important events of the chapter for the time since the last convention (Chicago, June, 1933). As a part of this report, a financial statement should be included.

RAILROAD RATES

The arrangements for reduced railway rates (by the receipt-certificate plan) of a fare and a third for the round trip have been made in the name of the American Association for the Advancement of Science and Associated Societies and are available to members of any society meeting with the Association at the time. Members of Phi Sigma *must* secure railway certificates *when purchasing tickets* to Saint Louis, stating that they are to attend the meeting of the American Association for the Advancement of Science. The rates are available from practically all over the United States and Canada. Certificates should be left at the A. A. A. S. registration room at the time of registration, in order that they may be endorsed by the A. A. A. S., and validated by the railway agent. They will later be returned to their owners and will then entitle the holder to purchase a return ticket at one-third of the regular one-way fare. There is a registration fee of $1.00.

CONVENTION BUSINESS

Each chapter is expected to send in to this office at the *earliest possible date* a list of all matters which it wishes discussed at the business meeting of the convention. It is obvious that this is the only way that our National Officers have of knowing your wishes, and it is hoped that if your chapter has any opinions to express, any criticisms to offer, or any desires which may affect the national organization, you will indicate them in a letter to the National Secretary at the earliest possible moment. If the chapters co-operate in this way, it will be possible to summarize such letters and lists, and prepare a letter which will be sent to each chapter for consideration *before* the convention. Each delegate may come to the convention instructed by his chapter on these questions, but he should in any case be left FREE to vote *as he thinks* best after he hears the discussion at the convention.

SCIENTIFIC SESSION

As has been the custom, the second day (Tuesday, December 31) has been reserved for the reading of papers by members, and also for any other junior research worker who may care to present a paper, in case such a person is from an institution not having a chapter of Phi Sigma. The Council reserves the right to reject any paper not presenting original work in which the author has at least participated. It is not expected that papers given by the junior research workers be long or erudite or profound—merely that they give the results of any research carried on by the member.

Titles with abstracts of not over two hundred words should be sent to this office *not later than* November 20. Please make every effort to have your chapter represented not only by your official delegate, but by *several* papers which are to be read at the scientific session. Please send the titles and authors of papers for your chapter at the earliest opportunity, even though abstracts cannot be sent until later. It is understood that abstracts of papers read will be published in the next number of the ''Biologist''.

TO SUM UP

1. Convention
   Saint Louis December 30, 31. Headquarters Warwick Hotel.
   Meeting room to be announced.
2. Delegates.
   One from each chapter if all national financial obligations have been met.
   Railroad fare only will be paid and in advance of trip.
   Banquet for delegates gratis.
   Reservations for hotel rooms should be made immediately.
   Delegates must be present at all meetings.
3. Chapter Reports.

To be sent with delegate and to cover last time since the summer of 1933.

4. Railroad Rates.
   Arrangements have been made for fare and a third rate.
   Certificates must be obtained at the time of payment of one-way fare to Saint Louis.
5. Convention Business.
   Send in list of business your chapter wishes discussed at convention *at once.*
6. Scientific Session.
   Titles of papers to be in this office by November 20.
   Abstracts (limited to 200 words) as soon as possible after this—but not later than December 1.

It is the sincere hope of your national officers, who are giving their time to the good cause for which Phi Sigma stands—the encouragement of the spirit of research among young biologists—that each chapter will do its best and co-operate to the fullest in making this convention the best Phi Sigma has ever held.

A. I. Ortenburger, *National Secretary.*

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THE NATIONAL TREASURER SPEAKS:

The steady year in year out business administration of an organization is one of the leading factors in its effectiveness and stability. In the case of Phi Sigma where there is a complete turnover of membership at least every four years, and of chapter officers nearly every year, the stability and the continuity of the National Council is a matter of vital importance to the Society as a whole. When you realize that every September the members of the Council are obliged to break in a new set of officers for each chapter, the task is not so easy. When electing chapter officers and convention delegates the chapter members should give every possible consideration to the practical fitness of those under discussion.

The administration of the Society on the economic basis which we can afford is one of our grave problems. Past conventions have been prone to give the National Council a mandate without supplying the means to carry it out. The Chicago Convention reduced the General Academic Assessment fifty per cent on the theory that it would not reduce the income of the Society as all delegates agreed that more than twice as many members would pay the reduced fees! Did it work out that way? Just the reverse turned out to be the case.

If, before proposing supposedly new legislation at the conventions, the delegates or chapters wishing such legislation would investigate and find out if what they propose has not already been tried in the past 20 years of our history, a great deal of time and confusion might be saved at our meetings.

If all chapters were financially clear on the books of the Treasurer it would reduce the time consumed by the Credentials Committee at the convention.

If, in dealing with the National Treasurer the following simple suggestions were followed the work of his office would be simplified:

Be accurate in all remittances for fees, stating explicitly what they are for.

Be sure to give the serial number of the initiate when remitting initiation fees.

Order all keys direct from the L. G. Balfour Co., Attleboro, Mass.

Read and make a study of the Constitution and By-Laws.

E. H. Stewart, *National Treasurer,*
Mesa, Colorado.

IDENTITY of the young lady is withheld, but the memory of her answer lingers on with the instructor conducting a science course at a local high school. One of the requirements in the written quiz was: "Define a bolt and nut and explain the difference, if any." The girl wrote:

"A bolt is a thing like a stick of hard metal such as iron, with a square bunch on one end and a lot of scratching wound around the other end. A nut is similar to the bolt only just the opposite, being a hole in a chunk of iron sawed off short, with wrinkles around the inside of the hole."

The startled professor marked that one with a large "A."

—*Williams & Wilkins Kalends.*

At the age of fifty, one settles down into certain well defined convictions, most of which are wrong.

Courage often consists as much in refraining to do as in doing.

EDITORIALS

Seventh Convention

THE dates, the hours, the place, have all been set for the seventh national gathering of the chapters of Phi Sigma. December 30 and 31 are the days. The hours will appear in the general program of the American Association for the Advancement of Science. The place is the Warwick Hotel, St. Louis. With the majority of Phi Sigma's thirty-four active chapters sending one or more delegates, there should be a fine assemblage of representative student biologists to discuss, debate and settle their own and the fraternity's problems. Out of this number too should come scientific reports of research in progress at our various parent institutions. As a fitting climax will come the convention banquet, and the address of the evening by Dr. David Causey (Mu '25), of the University of Arkansas. Dr. Causey has been a consistent and stimulating contributor to THE BIOLOGIST. His message will be awaited with pleasant anticipation. That the members of the National Council, and the Editor of your BIOLOGIST, look forward to meeting and working with your chapter delegates with just as keen anticipation goes without saying.

Why Zoology?

THIS subject was tentatively aired last Spring in the editorial pages of this magazine. At that time an article was promised for this issue. So many, and so much better, articles have been contributed that it would be a patent imposition for the editor to presume to crowd an already over-sized magazine. Rather than drop the subject without notice we may rapidly sketch here the outline on which we sought to build our article,—the one promised but which has died aborning. The uses of Zoology may best be catalogued under two heads, cultural and professional. Under the former one might view it first from the standpoint of intelligent awareness of life and its processes, surely rather important to anyone claiming an average education. Secondly it might rate attention from the stand of personal hygiene, information tending to the proper conservation and development of one's own physical resources, and to their repair when they have by age or accident become exhausted. The third cultural point of view might be mistakenly called sociological,—it deals, however, with zoological knowledge as a rather indispensable adjunct to the taking one's due place in the common life of all humanity as a home maker and propagator of the race.

The other great contribution of zoology is more or less professional, and in turn may also be considered under several heads. Education would be vapid without the zoological foundation for its fundamental psychology; agriculture impossible without entomology, and retarded without genetics; industry would lack much without ichthyology in our fisheries, paleontology in our mining and oil geology. What would athletics be without kinesiology, nursing without dietetics and hygiene? When one arrives at the multitudinous fields of theoretical and applied medicine, each with its specifically necessary basic zoological background the imagination balks. And some people ask: "Why Zoology?"

Free Aids

NOT only the prospective teacher of any biological subject, but the research worker as well, may find comfort and solace, not to say actual help and inspiration in the many well gotten up advertising pamphlets and office bulletins prepared by the various educational and laboratory supply houses in this country. On our desk as we write this editorial are such welcome visitors as "The Milvay Note Book" of the Chicago Apparatus Company, "Turtox News" published by the General Biological Supply House of Chicago, and the "Natural Science Bulletin" gotten out by Ward's Natural Science Establishment, Inc., of Rochester, N. Y. We seem to have mislaid George Conant's little dodger, "Triarch Topics," which comes from Ripon, Wis., but it is more than half likely that one of our lab assistants, tired of waiting for it to appear on our laboratory bulletin board, appropriated it for his own use. A penny post card does the trick with each of these companies, and if it is not the best pennyworth you ever spent we will be willing to eat the post-card, ink and all, although we are not industrious enough by far to be classed as a member of the Termites, and we gravely doubt if our intestinal canal has any cellulose-ophagous inhabitants.

Psi Chapter's By-Laws

AGAIN we renege. In spite of a promise made last Spring, we are not going to discuss the merits and demerits of the By-laws which Psi Chapter has seen fit to add to its local regulations. We shall print them without comment in this issue. They may be found in the place of Psi's news letter which also failed to arrive in time for publication.

Of Broadmindedness

PRACTICING what one preaches is a virtue which, like Shakespeare's Danish Sunday, "is more honored in the breach than in the observance." Why this should be so is hard to understand. The facts are fairly clear, however. Not only professional preachers, but those either actually or figuratively elect who mount the platform to tell others how to think, talk or do inevitably fall victims to the very doctrines which they preach. Take, for instance, our great leaders in the world of literature, politics, or science. Is there any one virtue which collegiate education holds up, and has held up, as a condition sine qua non of future leadership greater than broadmindedness? To hear the average exhorter of freshmen orate during the first semesters of a college career one would be strongly inclined to think that broadmindedness, like charity, "covereth a multitude of sins." And so the guileless fool, Sir Stripling, and his innocent lady, La Demoiselle, both gullible and wide-eyed, enter their collegiate probation highly resolving to be broadminded, or perish in the attempt,—an alternative in which many of them unfortunately succeed. If they were only old enough, or wise enough,—the two are not necessarily compatible,—and casually looked about them, they might see and hear much to make them pause in a headlong career of achieving breadth of mind. Most emphatically it is NOT the broadminded people who succeed. Read the works of George Bernard Shaw, H. L. Mencken, Theodore Dreiser, Dean Inge, Gilbert K. Chesterton, in literature; listen to General Johnson, Colonel Knox, Mr. Hoover or even Al Smith in politics; get behind the scenes in science,—for the love of our profession, let the rest be silence. In these, as in every occupation, the leaders who are followed, the men and women whose success merits for them more than a brief "also ran" in the reports of the race, or a trite obituary afterwards, are the pig-headed, self-reliant, achievement-motivated human dynamos who dig deep in their own fields, and come up with the shining metal of success. Let us not be too impressed with this genteel virtue of being broadminded. Better to cultivate a few deep likings, some equally deep dislikes, have a few cherished principles, and a few that you abhor. Survey the fields of knowledge, extend them as far as you can, but go deep into one or two. Remember that deep water does not stagnate, shallow does, before it evaporates. Paradoxically enough, being broadminded is the privilege and the right only of the very young, the poor, the lame, the halt, the blind. Narrow-mindedness is the way to equally beautiful success or equally disastrous failure. It is a way that is jealously kept, and where is the broadminded college professor who is willing to betray the secrets of his clan and craft?

'Tis well to take things as they be
  In peace or strife, for weal or woe,
But 'tis not up to you and me
  To sit inert and leave them so.
If things are wrong, let's make 'em right,
If things are dull let's make them bright.
And if they're good, 'tis well to plan,
To make 'em better if we can.

—*John K. Bangs.*

You probably have heard this one before, but this is how we heard it first:

"Shortly after modern education filtered down to the common schools of Japan, the study of Zoology was introduced in the high schools. Here is a Japanese student's description of a fairly common amphibian:

" 'What a wonderful bird the frog are. When he stand he sit, almost. When he hop he fly, almost. He aint got no sense, hardly. He aint got no tail, hardly, either. When he sit, he sit on what he aint got, almost.' "

It isn't your position that makes you happy or unhappy. It's your disposition.

The difference between stumbling blocks and stepping stones is the way you use them.

CHAPTER NEWS LETTERS

Alpha

(Inactive) c/o Dr. A. E. Waller, Botany Department, Ohio State University, Columbus, Ohio.

Beta

President—James B. Griffen, Museums Bldg., University of Michigan, Ann Arbor, Michigan.

Vice-President—T. P. Haines, 3110 Natural Sci. Bldg., Univ. of Michigan, Ann Arbor, Michigan.

Recording Secretary—Margaret L. Liebe, Room 3028, Museums Bldg., Univ. of Mich., Ann Arbor, Michigan.

Corresponding Secretary—Miss Lois Jotter, Botany Dept., University of Michigan, Ann Arbor, Michigan.

Treasurer—Thomas Weller, 1130 Fair Oaks Avenue, Ann Arbor, Michigan.

Gamma

(Inactive) North Dakota Agricultural College, Agricultural College, North Dakota.

Delta

Ruth C. Harding, 162 College Road, Orono, Maine.

Epsilon

President—Mr. Beverly Hart, 2060 So. Gaylord, Denver, Colorado.
Vice-President—Gertrude Luebke, 2076 So. Fillmore, Denver, Colorado.
Secretary—Miss Elizabeth Lewis, 2930 E. 14th Ave., Denver, Colorado.
Treasurer—Jack Cotter, 2335 Hudson Street, Denver, Colorado.
(Other officers to be elected in fall, so 3 old officers continue until then)

Dr. E. B. Renaud, Professor of Anthropology of the University of Denver, President of the Colorado-Wyoming Academy of Science, has been knighted by the French Government for his scientific work in

Anthropology and Archaeology on America on the basis of his studies in Europe. He has written, in English and in French, over 40 articles and reports published in Europe and America. He has conducted several expeditions in Colorado, Wyoming, Nebraska and New Mexico as Director of the Archaeological Survey of the High Western Plains. On May 28th he will be presented by the French Consul General with the Cross of a Knight of the Legion of Honor.

Zeta

President—G. L. Ott, Genetics Bldg., Univ. of Wisconsin, Madison, Wisconsin.
Vice-President—A. D. Hasler, Biology Bldg., Univ. of Wisconsin, Madison, Wisconsin.
Secretary—V. G. Sprague, Agronomy Bldg., Univ. of Wisconsin, Madison, Wisconsin.
Recording Secretary—S. S. Atwood, Biology Bldg., Univ. of Wisconsin, Madison, Wisconsin.
Editor—W. F. Hollander, Genetics Bldg., Univ. of Wisconsin, Madison, Wisconsin.
Treasurer—B. L. Kline, Agricultural-Chemistry, Univ. of Wisconsin, Madison, Wisconsin.

On May 9 Zeta Chapter initiated Dr. Royal Alexander Brink into honorary membership. Dr. Brink is a native of Ontario province, with a bachelor's degree from the University of Toronto, a master's from Illinois, and a doctorate from Harvard. Coming to the University of Wisconsin in 1922 as assistant professor of Genetics, he has risen to the professorship which he received in 1931. He is a member of many scientific societies, and a fellow of the National Research Council. He has published papers as a result of his research on plant breeding, partial sterility in maize, the dynamics of the gene, and pollen physiology.

Eta

President—Oliver Musser, 256 Dayton Place, Akron, Ohio.
Vice-President—Sanford Rosenman, 54 Aqueduct Street, Akron, Ohio.
Secretary—Beatrice Toharsky, 425 Willow Street, Akron, Ohio.
Treasurer—Solomon Miller, 1013 Delia Avenue, Akron, Ohio.

Theta

President—L. P. Anderson, Bacteriology Dept., Mich. State College, East Lansing, Mich.
Vice-President—Nathan K. Ellis, Soils Dept., Mich. State College, East Lansing, Mich.
Secretary—J. R. Stiefel, Physiology Dept., Mich. State College, East Lansing, Mich.
Treasurer—Wm. Smith, Horticulture Dept., Mich. State College, East Lansing, Mich.

Iota

President—Ed Sulkin, 4417 Forest Park Blvd., St. Louis, Missouri.
Vice-President—Chester Nunn, Theta Xi House, Washington University, St. Louis, Missouri.
Secretary—Helen Bramsch, 5112 Wabada Ave., St. Louis, Missouri.
Treasurer—Darwin Nuohauer, 4572 Chouteau Ave., St. Louis, Missouri.

Kappa

President—Donald Obee, Botany Dept., Univ. of Kansas, Lawrence, Kansas.
Vice-President—Lewis Coriell, Bacteriology Dept., Univ. of Kansas, Lawrence, Kansas.
Secretary—Lyman S. Henderson, Dept. of Entomology, Univ. of Kansas, Lawrence, Kansas.
Treasurer—Miss Ruth Cady, Dept. of Bacteriology, Univ. of Kansas, Lawrence, Kansas.

Lambda

President—Lilian Ruth Hopkins, 219 5th St. W., Missoula, Montana.
Vice-President—Royal Turley, 300 W. Broadway, Missoula, Montana.
Secretary—Wanlyn D. Johnson, 434 Backwith Avenue, Missoula, Montana.
Treasurer—Margaret Ann Brome, Corbin Hall, Missoula, Montana.

Mu

President—Omer C. Stewart, Room 1, Anthropology Building, University of California.
Vice-President—Barbara D. Blanchard, 2593 Life Sciences Bldg., University of California.
Treasurer—Ben Glading, 4075 Life Sciences Bldg., University of California.
Secretary—Thomas G. Aitken, 112 Agriculture Hall, University of California.

A great deal of variety has been introduced into the program of activities of Mu Chapter this past semester. The many original suggestions put forward by our enterprising president were subscribed to enthusiastically by the 50 active members of the Society.

To begin with, the meetings have been more varied than previously. The first gathering of the semester was a dinner meeting held at one of the popular campus restaurants; the second meeting was held in the evening at one of the Bacteriology laboratories, refreshments being provided by members of the Household Science department; the third and culminating affair of the semester, the initiation banquet, was celebrated at the Berkeley Women's City Club.

Last April, President Stewart started the custom, continued this semester, of inviting a graduate student member of Phi Sigma to give a ten-minute talk at the beginning of the meeting, on some phase of his or her own research. By asking a member from a different department for each meeting, we were able to keep in touch with the trends in research in the many branches of the biological sciences.

The most significant innovation of the year was the election to Phi Sigma of students from the department of Anthropology, hitherto represented by only one member, and the department of Psychology, never before represented in the Society. Since these two sciences are becoming more and more important as branches of modern biology, it seemed only proper that students working in these fields should be invited to join Phi Sigma.

The initiation banquet, held October 30, was a most delightful affair. The new members from Anthropology and Psychology bore the brunt of the witty pleasantries indulged in by the toastmaster, Dr. William B. Herms, and cleverly carried on by the other speakers. Dr. C. W. Brown, responding for the faculty initiates, gave an amusing as well as instructive talk on the process by which he, a psychologist, was becoming ''biological''. Miss Mae Vanette Ott responded for the initiates. As the culminating feature of the evening, Dr. Charles A. Kofoid, chairman of the department of Zoology, presented an illuminating talk on ''What Stimulates Biological Progress?'' Following are the names of the initiates:

Faculty: Dr. Clarence W. Brown; Dr. Albert P. Krueger.

Students: C. June Curts, Betsy I. Doane, Grace E. Drake, Robert F. Heizer, Louise F. Lorenz, Charles B. McKee, Demitri B. Shimkin, Harry Tschopik, Jr., Constance H. Gregory, William A. McOmie, Adelyn L. Helsley, Mae Vanette Ott, Carl G. Kadner, John H. Rayner, Charles F. Pentler, Elizabeth Richardson, Mary M. Haynie, Elizabeth Hodgkin, Wilma L. Smyth, Frances D. Taylor, Leroy W. Andrews, Frances E. Christensen, Norman D. Levine, Bruce D. Whitaker.

From other chapters: Mrs. Ben Glading, Dr. Adriance Foster, Mr. John Mohr.

Mr. Datus Hammond, graduate student in Zoology, has been chosen to represent Mu Chapter at the National Convention in St. Louis.

BARBARA D. BLANCHARD, *Vice-President.*

Nu

President—Jacob Moses, 28 W. Wylie Avenue, Washington, Pennsylvania.
Vice-President—James D. Maxwell, 900 Jefferson Avenue, Washington, Pennsylvania.
Secretary-Treasurer—C. A. Ely, 1010 Jefferson Avenue, Washington, Pennsylvania.

Nu Chapter has begun another year of activity at Washington and Jefferson College and is expecting this year to be one of the most successful years of its existence. Plans are being made to expand our program to include a series of lectures by prominent biologists and physicians of this district, various practical demonstrations of biological problems by the members of the society as well as the presentation of a number of papers on modern biological studies. We are also planning to repeat later on in the season the holding of an open house in the biology building which was done so successfully last year.

On October twenty-third we initiated into Nu eight new members all of whom are deeply interested in those factors for which the society stands. Upon them largely will rest the responsibility for the success of the year's program. The initiates are:

1, E. P. Albright; 2, R. S. Averill; 3, J. G. Butters; 4, J. M. Clutter; 5, B. Jaffe; 6, S. N. Kelso; 7, R. W. Kline; 8, T. J. Morgan.

The society feels that it has lost an invaluable source of aid and inspiration due to the illness of Dr. C. D. Dieter, head of the Biology Department, which will keep him from his various activities for several months.

CHARLES A. ELY, *Secretary.*

Xi

(Inactive) Elmer Palmatier, Room 210, Bessey Hall, University of Nebraska, Lincoln, Nebraska.

Omicron

(Inactive) c/o Dr. E. A. Baird, Botany Department, University of North Dakota, Grand Forks, N. D.

PI

President—W. B. Redmond, Box 534, Emory Univ., Georgia.
Vice-President—Heywood Moore, Emory Univ., Georgia.
Secretary—Nelson T. Spratt, Jr., Biology Dept., Emory Univ., Georgia.
Treasurer—Eva Sherwood, c/o Nurses' Home, Emory Univ., Georgia.

Rho

President—Frank Thorp, Jr., Animal Pathology Lab., Univ. of Ill., Urbana, Ill.
Vice-President—H. L. Gravitt, 301 Nat. Hist., Univ. of Ill., Urbana, Ill.
Secretary—Walter Mumm, 110 Agriculture Bldg., Univ. of Ill., Urbana, Ill.
Treasurer—Bernadine Meyer, 212 Woman's Bldg., Univ. of Ill., Urbana, Ill.

Last Spring Rho Chapter initiated as an honorary member Dr. F. W. Tanner of the bacteriological department at the University of Illinois. He is a native of New York state, receiving his bachelor's degree from Wesleyan, his master's and doctorate from Illinois. From an assistancy at the university in 1915 he has attained to the head of his department in 1923. His published works summarize his research in the mycology of foods, yeasts, food bacteriology, bacterial metabolism, and sanitary chemistry.

Sigma

President—Dr. G. F. Weber, Experimental Station, Gainesville, Florida, (University of Florida).
Vice-President—Dr. P. H. Senn, Agriculture College, Univ. of Florida, Gainesville, Florida.
Secretary and Treasurer—Professor H. K. Wallace, Biology Dept., Univ. of Florida, Gainesville, Florida.

Tau

President—John Stuart Rankin, Zoology Dept., Durham, North Carolina.
Vice-President—J. Woodrow Wilson, 905 Monmouth Ave., Durham, North Carolina.
Secretary—Helen Spangler, Box 702 College Station, Durham, North Carolina.
Treasurer—Webur Duncan, Botany Dept., Durham, North Carolina.

Upsilon

President—Lewis Roth, 116 W. Spring, Oxford, Ohio.
Vice-President—John Duerr, 209 N. Campus, Oxford, Ohio.
Secretary—Ned Linegar, 18 East Spring St., Oxford, Ohio.
Treasurer—Bertha Davison, 600 Stanley, Middleton, Ohio.

Phi

President—W. Herbert Gifford, Phi Mu Delta House, Durham, New Hampshire.
Vice-President—Doris Goodwin, Durham, New Hampshire.
Corresponding Secretary—Leon C. Glover, Dept. of Entomology, Univ. of New Hampshire, Durham, New Hampshire.
Recording Secretary—Philip Wright, Durham, New Hampshire.
Treasurer—Dr. Stuart Dunn, Dept. of Botany, Univ. of New Hampshire, Durham, New Hampshire.

Chi

President—Fred Parke, Lewis Hall, Bozeman, Montana.
Vice-President—Kathryn Lyon, 310 W. Mendenhall, Bozeman, Montana.
Secretary—Arthur Ferkin, Pi Kappa Alpha, Bozeman, Montana.
Treasurer—Winnifred Boewer, 718 So. Seventh, Bozeman, Montana.

Psi

President—Miss Harriet Exslive, Dept. of Zoology, Univ. of Washington, Seattle, Washington.
Vice-President—Mr. Herbert Reiter, Johnson Hall, Univ. of Washington, Seattle, Washington.
Secretary—Mr. Daniel Stuntz, Johnson Hall, Univ. of Washington, Seattle, Washington.
Treasurer—Mr. Charles Davis, Johnson Hall, Univ. of Washington, Seattle, Washington.

The primary reason for the adoption of our Chapter By-laws was that a few self-appointed members would constitute themselves a committee to restrict membership on purely personal bases. The National Constitution specifically states that the election of new members shall be by secret ballot, so we could not require that a member give a reason for black-balling a prospective member. On searching for the cause of the trouble, we found that often times these personal prejudices were based on hearsay, petty personal qualities, or lack of knowledge of the candidate and his qualifications. Consequently we wrote in this most important part of our by-laws as follows:

1. A subcommittee to the regular membership committee shall be formed which shall consist of one member from each department in the field of biology. This committee shall be responsible to the regular membership committee.

2. The duties of each member of the subcommittee shall be to procure from every faculty member in his department, and from any other available source, the names of all candidates in his department. These names shall be turned over to the regular membership committee to be checked with the registrar for grade requirements. The subcommittee shall obtain for all the remaining candidates who satisfy the grade requirements a written statement which shall include: a statement of the candidate's year in school, a statement of how long he has been in residence in the University of Washington, the character of his research work, and the length of time that he has been pursuing such work. It shall also include any statements concerning his ability as may come from faculty members of the department concerned. This report shall be presented to the membership committee."

The result of this move has surpassed our greatest expectations. The election of new members has evolved from a disorderly long-drawn-out debate, to a short orderly presentation of each name with the facts stating his qualifications. The secret ballot is then taken after all facts have been presented. We have tried this at two elections, and offer it in itself—as an adequate reason—or defense for chapter by-laws.

Omega

President—James Bragg, Zoology Dept., Univ. of Oklahoma, Norman, Okla.
Vice-President—O'Reilly Sandoz, Zoology Dept., Univ. of Oklahoma, Norman, Okla.
Secretary—Wilda Fritts, Botany Dept., Univ. of Oklahoma, Norman, Okla.
Treasurer—Paul Phillips, Zoology Dept., Univ. of Oklahoma, Norman, Okla.

Alpha Alpha

President—Miss Archie McLeon, 24 N. Olive, Alhambra, California.
Vice-President—Irene Reid, 1021¾ Leighton Ave., Los Angeles, California.
Corresponding Secretary—Miss Ni, 1016 36 Place, Los Angeles, California.
Recording Secretary—Frances Cramer, 766 Obispo, Long Beach, California.
Treasurer—Mr. Herbst, 2720 Live Oak St., Huntington Park, California.

Alpha Beta

President—Howard Hughmanic, 1311 Shriver Ave., N. E. Canton, Ohio.
Vice-President—Robert White, Sigma Nu House, S. Union Ave., Alliance, Ohio.
Recording Secretary—Selman Liebschner, 542 Euclia Åve., Salem, Ohio.
Corresponding Secretary—Marjorie Pattison, 141 Simpson St., Alliance, Ohio.
Treasurer—Warren Curtis, 31 W. Dewey Ave., Youngston, Ohio.

Alpha Gamma

(Inactive) Albert Fauth, 309 Lewis St., Vermillion, S. D.

Alpha Delta

President—Ruth Nelson, 39 Bellaire Ct., Appleton, Wisconsin.
Vice-President—Patricia Leek, Russell Sage Hall, Appleton, Wisconsin.
Secretary—Doris Boettcher, Route 3, Box 71, Appleton, Wisconsin.
Treasurer—Wilson Schier, Delta Tau Delta, Appleton, Wisconsin.

Alpha Epsilon

President—Henry Idzkowsky, Dept. of Zoology, Univ. of Pittsburgh, Pittsburgh, Penn.
Vice-President—Warren Witz, Dept. of Botany, Univ. of Pittsburgh, Pittsburgh, Penn.
Secretary—Philip Walker, Dept. of Botany, Univ. of Pittsburgh, Pittsburgh, Penn.
Treasurer—William Starkey, Dept. of Zoology, Univ. of Pittsburgh, Pittsburgh, Penn.

Alpha Zeta

President—Eugene Barclay, Pi Kappa Alpha House, William and Mary College, Williamsburg, Virginia.
Vice-President—Frederic Eidsness, Sigma Alpha Epsilon House, Williamsburg, Virginia.
Secretary—Elizabeth Jones, Pi Beta Phi House, William and Mary College, Williamsburg, Virginia.
Treasurer—Carol Gouldman, Pi Beta Phi House, Williamsburg, Virginia.

Alpha Eta

President—Earl Pritchard, Entomology Dept., Oklahoma A. & M. College, Stillwater, Oklahoma.
Vice-President—Marion Spore, (no address).
Secretary-Treasurer—Mary Louise Stout, Zoology Dept., Oklahoma A. & M. College, Stillwater, Oklahoma.

Alpha Theta

President—Harley English, College Station, Pullman, Washington.
Vice-President—Dwight Forsyth, 110 Columbia Ave., Pullman, Washington.
Secretary—Wilma Hudleson, 309 Dilke Street, Pullman, Washington.
Treasurer—Harry Katznelson, 706 Campus Ave., Pullman, Washington.

Alpha Iota

President—Kenneth Herrold, St. Catherine Street, Lewisburg, Pa.
Vice-President—Thomas Fagley, (home) 122 N. Oak St., Mt. Carmel, Pa. (school) Tau Omega Omicron House, Lewisburg, Pa.
Secretary-Treasurer—Elizabeth Byerly (home) 3001 N. 3rd St., Harrisburg, Pa. (school) Women's College, Lewisburg, Pa.

Alpha Kappa

President—Margery Greene, 2199 Holland Ave., New York City, New York.
Vice-President—Leonore Sabin, 250 W. 75 St., New York City, New York.
Secretary—Mildred Schweiger, 64 Jesup Place, New York City, New York.
Treasurer—Miss Ethel Poris, 1555 Inwood Avenue, Bronx, New York.

Alpha Lambda

President—Don Grayor, 1386 Butler Ave., Salt Lake City, Utah.
Vice-President—Perry Plummer, 757 McClelland St., Salt Lake City, Utah.
Secretary—Estelle Calderwood, 825 South 10th East, Salt Lake City, Utah.
Treasurer—Harold Norton, 1169 East 5 South, Salt Lake City, Utah.

We have begun our meetings for the 1935-36 season. Already we have enjoyed a very enlightening lecture on the value of the ''Probable Error Factor in Research'' by one of our Entomology professors, Dr. Stephens.

Last week we took a thrilling trip to the Uinta Mountains which provided opportunity for everyone to collect specimens or to study something pertaining to his field of interest.

Last year we finished the season with a most interesting lecture, beautifully illustrated with moving pictures, on the Green River of Utah; a very wild, little explored river course in the mountain canyons of Southern Utah. Dr. Lee Kay was our guest speaker. And Mr. Kelly Ryan of the Ogden Experimental Station gave us a fine lecture on the water shed and vegetation problems of Utah.

Then to leave each other for the Summer in gala spirits we had a jolly, well attended canyon party at the home of Mr. Sylvester Walsh in Emigration Canyon. And we had fun!

We miss Mr. Harold Austin who has gone to Northwestern University to finish Medicine, Mr. William Haymond who is now at Rush Medical College, Mr. Jim Wilding now at Indiana State College, working for his Ph.D. in Zoology, and Mr. George James who is finishing his Medical course at Louisiana State College. One of our favorite faculty members is away at Stanford, on leave of absence, working for a Ph.D., Mr. Don Rees.

Our graduates were Mr. Arden Gaufin, B.S.; Miss Lily Meldrom, B.A.; Miss Janet Mitchel, B.S.; Mr. Roy Rudolph, B.S.; and Miss Afton Williams, B.A.; Miss Cornilia McCarry; Mr. Perry Plummer, B.S.; Mr. Harold Norton, B.S.; Miss Mary Cannon, B.S.; and Mr. Harold Austin, Two Year Medical certificate.

Every member of Alpha Lambda comes clamoring for his "Biologist" each time one is published. And we enjoy reading the articles together and discussing them. If every chapter is as interested as ours, the magazine is well worth while.

ESTELLE CALDERWOOD, *Secretary.*

Alpha Mu

President—Bud Crowell, Sigma Phi Epsilon, Oregon State College, Corvallis, Oregon.
Vice-President—Man Parrott, Zoology Dept., Oregon State College, Corvallis, Oregon.
Treasurer—Tom Taylor, Theta Chi, Corvallis, Oregon; (home) 1014 Adams, Olympia, Washington.

Alpha Nu

President—Garth Blakely.
Vice-President—Ann De Huff.
Secretary—Miss Ruth Brock, University of New Mexico, Albuquerque, N. M.
Treasurer—Miss Dorothy Lipp.

THE INSTALLATION OF ALPHA NU CHAPTER

Alpha Nu Chapter of Phi Sigma was installed at Albuquerque, New Mexico on April 21, 1935. The installation exercises were held in Sarah

Reynold's Hall on the campus of The University of New Mexico. Dr. A. I. Ortenburger, National Secretary of Phi Sigma, Professor of Zoology at the University of Oklahoma, acted as the installing officer. He was assisted by Dr. E. F. Castetter and Dr. F. W. Allen.

The following persons were initiated as charter members of Alpha Nu Chapter:

Roy Barker, Garth Blakely, Ruth Brock, Dr. E. F. Castetter, Catherine Chiles, Ann De Huff, Mildred Faris, Le Ferrell, Horace Gardner, Grace Gholson, Marie Jenson, Avis Johnson, David Lewis, Norman Lincoln, Dorthy Lipp, Glescia Perce, Marvin Rohovec, Waldemar Schaefer, Sarah Shortle, James Teare, Marjorie Van Cleave, Mary Wiggins, Jean Wiley.

A number of others were unable to be present but it is expected that they will be initiated during the present school year. After the initiation of the charter members the following chapter officers were elected and installed: President, Marvin Rohovec; Vice-President, Ann De Huff; Secretary, Ruth Brock; Treasurer, Dorthy Lipp.

The National Secretary then declared the new chapter installed and many messages of congratulation from the national officers and chapters were read.

The installation banquet was held the same evening at 7:00 P. M. in the Indian Room of the Franciscan Hotel at which time President J. F. Zimmerman of the University of New Mexico gave an address of welcome to Phi Sigma as a new organization of the campus. Dr. F. W. Allen who acted as toastmaster then asked the installing officer, Dr. A. I. Ortenburger, to say a few words on the "Aims of Phi Sigma". Response for the chapter was given by the newly elected chapter president, Mr. Marvin Rohovec. Following the banquet the group returned to the Sarah Reynold's hall where Dr. Ortenburger gave the address of the evening, "Zoogeography". It is only fitting that the installing officer take this opportunity to express his appreciation for the many courtesies extended to him while in Albuquerque. The fine enthusiastic spirit of the group installed will insure a successful chapter which will live up to the purpose of Phi Sigma—the encouragement of the spirit of research among young biologists.

DR. A. I. ORTENBURGER, *Secretary.*

Alpha Xi

President—Theresa Matorese, Chi Omega House, Rhode Island State College, Kingston, Rhode Island.

Vice-President—Samuel Eisenstadt, Zoology Dept., Rhode Island State College, Kingston, Rhode Island.

Secretary—Barbara Haley, Chi Omega House, Rhode Island State College, Kingston, Rhode Island.

Treasurer—Harry Brownell, Phi Mu Delta House, Rhode Island State College, Kingston, Rhode Island.

INSTALLATION OF ALPHA XI CHAPTER

Alpha Xi Chapter of Phi Sigma was duly installed May 17, 1935 at 3:30 P. M. in Agriculture Hall, Rhode Island State College, Kingston, Rhode Island with sixty-four charter members. The installation was conducted by the National Chancellor with the assistance of Dr. Harold W. Browning, Zeta, and Professor Herbert M. Emery, Phi. The chapter is fortunate in being sponsored by Dr. Browning, a charter member of Zeta Chapter, a highly respected and popular professor of botany. The first officers of the chapter were Mr. Michael DiMaio, President; Miss Madeline Marks, Vice-President; Mr. George Gilmore, Secretary; and Miss Lynette Goggin, Treasurer. Fiften chapters offered congratulations.

Following the installation, members and guests assembled for the installation banquet in East Hall. The tables were beautifully decorated, both with flowers and stuffed turkey. At each plate was a copy of Volume I, Number 1 of THE CELL, edited by the Treasurer of the society, Miss Lynette Goggin. The magazine contained historical data, scientific papers, poetry and humor, also boners. Dr. Browning acted as toastmaster. The Chancellor welcomed the new chapter and outlined briefly the policies and aims of the fraternity. The President of Alpha Xi Chapter, Mr. Michael DiMaio, responded with an account of the past efforts of the local society to make history on the campus and gave assurance that Alpha Xi would conduct itself in such a way as to make the other chapters very envious. Dr. John Barlow, Dean of the School of Science and Vice-president of the college, followed with a fascinating account of the early development of courses in science in the college. Equipped, as we are now, with extensive laboratories for the separate sciences, few of us realize the eternal struggle which has made such things possible. Dr. Barlow has lived through it all. His account was filled with tears and laughter, and should be broadcast to the world. The final address was presented by Dr. Raymond G. Bressler, President of the college. Dr. Bressler is a relatively young man, possessed of a most pleasing and dynamic personality. His enthusiasm is contagious. Every eye sparkles as he rises to speak. Choosing as his topic "The Professional Fraternity", he welcomed Alpha Xi Chapter, expressed his desire to cooperate in every way to make the venture a success but warned the group that it must justify its existence by hard work and close attention to the promotion of research work in biology.

A surprise feature of the banquet was the unannounced appearance on the program of a delegate from Phi Chapter who had surmounted many obstacles in his jaunt from Durham to Kingston. The Chancellor has had many reasons to be proud of Phi Chapter in the past, but this friendly gesture was executed with such finesse and despatch that he is left without words to express his appreciation.

As usual, the banquet was followed by a popular scientific address by the installing officer. Dr. Bressler honored the chapter by his presence as did many members of the faculty and student body. Attention was called to the recent advances in cyto-genetics with special reference to our increasing knowledge of the structure of the chromosome and the new method of locating the genes.

Rhode Island State College is ideally located in an open countryside not far from Narragansett Pier. Forty-one courses in Botany, Zoology, and Bacteriology are offered. Swamps, fields, forests, lakes, and the ocean are near at hand. Excellent facilities for research are assured by an ever increasing supply of material equipment both in the college and in the Agricultural Experiment Station. New Buildings are appearing as if by magic. The excellent morale of the teaching and research staff and of the student body is a tribute to the brilliant leadership of Dr. Bressler. Phi Sigma may well expect much of Alpha Xi.

PAUL A. WARREN, *National Chancellor.*

To keep out of trouble, breathe through the nose; it keeps the mouth closed.

DEAR DR. KEEFE: Oct. 17, 1935.

On May 17, you may recall the Biological Society of Rhode Island State College was officially inaugurated as the Alpha Xi Chapter of Phi Sigma by Chancellor Paul A. Warren. At that time I was installed as president. I was graduated from Rhode Island State College in the following June, and am at the present time studying medicine at the Johns Hopkins University Medical School, Baltimore, Maryland. During my short stay here I have been impressed by the many members of Phi Sigma that I have met doing graduate or professional work in Baltimore. It gives one a great deal of pleasure and satisfaction to think that after leaving one institution of learning and upon entering another many miles away, that there is some connecting link such as Phi Sigma to make you feel right at home at all times. The feeling of friendliness is gratifying to say the least.

I can safely say now that the time and energy which was spent by the officers and members in the process of establishing Phi Sigma at Rhode Island was well worth it. This being the case, I am sure that this year's Alpha Xi will do its utmost in preserving the high standard of the Phi Sigma Society.

May I take this time to thank the various chapters of the Phi Sigma Society for the many thoughtful letters of congratulation which were received during our installation. They were very much appreciated, and may I add my best wishes for a most successful Phi Sigma year.

Sincerely yours,

MICHAEL DI MAIO
Former President Alpha Xi
Chapter Phi Sigma

The Johns Hopkins Medical School
Baltimore, Maryland

Oct. 2, 1935.

MY DEAR DR. KEEFE:

Mr. Guy Gardner, our District Freight and Passenger Representative, Denver, Colorado, received request from Mr. Erwine Hall Stewart, National Treasurer of your organization address Mesa, Colorado, to furnish you regular one way fares applying from St. Louis to the following points account meeting of American Association for the Advancement of Science in St. Louis latter part of December, 1935:

		First-Class	Intermediate	Coach
Medford, Massachusetts		$43.76	—	—
Seattle, Washington	via Chicago	67.86	$45.24	$40.00
	via Kansas City	66.61	44.41	40.00
Norman, Oklahoma		16.81	—	11.22
Grand Junction, Colorado		36.06	—	24.05
Depere, Wisconsin		14.45	—	9.64
Ann Arbor, Michigan		15.80	—	—
Orono, Maine		52.66	—	—
Denver, Colorado		27.33	—	18.23
Madison, Wisconsin		12.57	—	8.39
Akron, Ohio		19.10	—	—
Lansing, Michigan		16.19	—	—
Lawrence, Kansas		9.56	—	6.38
Missoula, Montana	via Chicago	51.43	—	34.08
	via Kansas City	49.97	33.30	33.30
Berkeley, California		61.11	40.75	—
Washington, Pennsylvania		21.93	—	—
Lincoln, Nebraska		14.02	—	9.35
Atlanta, Georgia	via Cincinnati	19.72	—	—
	via Louisville	18.78	—	9.39
Urbana, Illinois		5.21	—	3.48
Durham, North Carolina	via Cincinnati	28.12	—	—
	via Louisville	26.85	—	13.43
Bozeman, Montana	via Chicago	44.97	—	—
	via Kansas City	43.51	—	29.02
Oxford, Ohio		11.93	—	—
Durham, New Hampshire		45.80	—	—
Los Angeles, California		61.11	40.75	40.75
Alliance, Ohio		20.09	—	—
Appleton, Wisconsin		14.21	—	9.48
Pittsburgh, Pennsylvania		22.24	—	—
Williamsburg, Virginia		30.88	—	—
Stillwater, Oklahoma		15.18	—	10.13
Pullman, Washington	via Chicago	59.15	39.44	—
	via Kansas City	57.69	38.45	38.46
Lewisburg, Pennsylvania		30.47	—	—
New York, New York		38.06	—	—
Salt Lake City, Utah		42.43	28.29	28.29
Corvallis, Oregon	via Chicago	69.77	—	—
	via Kansas City	65.90	43.93	40.00
Kingston, Rhode Island		43.12	—	—
Albuquerque, New Mexico		35.03	23.36	23.36
Gainesville, Florida		28.68	—	14.34

We note next issue of your magazine will go to press soon, and Mr. Stewart advised you would print free notice of Baltimore & Ohio Service. If we can be of further service, please do not hesitate to call upon us.

Cordially yours,

R. A. PEARCE,
General Passenger Agent.

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BOOK REVIEWS

Reviews printed here represent the candid opinions of various readers, not necessarily those of the members of the National Council, nor even those of the Editor. An address list of all publishers whose books are reviewed in this issue will be found at the end of the section.

ABORIGINAL POPULATION OF NORTHWESTERN MEXICO, CARL SAUER; *University of California Press, Berkeley, 1935. 35 cents.*

This excellently printed 34-page pamphlet presents adequate statistical evidence that the aboriginal population of the northwestern areas of old Mexico lying east of the Gulf of California was approximately that of the population of today. A valuable study for American prehistorians, those interested in Ibero-Americana and anthropologists in general.

THE ALGAE AND THEIR LIFE RELATIONS, JOSEPHINE E. TILDEN; *University of Minnesota Press, Minneapolis, 1935. $5.00.*

550 pages of well-illustrated and interestingly written material by one of our best-known and most highly respected veteran algologists. Should be in every college library and among the prized possessions of every student in botany,—a book no algologist can afford to do without.

AMERICAN SCIENTISTS, CLARENCE J. HYLANDER; *The Macmillan Company, New York, 1935. $2.00.*

Twenty-eight biographies of national scientific worthies have been keyed in an admirably practical tone by Dr. Hylander with the result that this book merits more than passing attention. It should be in every public and high school library, although collegians seeking a not too brief summary of the aims and achievements of great past and present scientists will find it helpful.

THE ANCESTRY OF THE LONG-LIVED, RAYMOND PEARL and RUTH DEWITT PEARL; *The Johns Hopkins Press, Baltimore, 1934. $3.00.*

Carefully documented evidence over a wide range of subjects and from many different view-points leads the Pearls to the conclusion that longevity appears to be biologically a rather fundamental attribute of the organism which in man is indeed a very complex matter, and to be viewed with an open mind for the present, rather than definitely explained according to any Mendelian theory, however complicated. A valuable book.

APPLIED ANATOMY AND KINESIOLOGY, WILBUR PARDON BOWEN; *Lea & Febiger, Philadelphia, 1934. $3.75.*

A fifth edition of another of those most valuable texts published under the editorship of Major R. Tait McKenzie, sculptor and physical education research possessor. Practical for those interested in their own muscular development, essential to the instructor who has to combine physical education with teaching.

APPLIED ENTOMOLOGY, H. T. FERNALD; *McGraw-Hill Book Company, Inc., New York, 1935. $3.50.*

The third edition of a standard textbook preserves all the tried and truly practical features of its predecessors with the added advantage of being brought into line with the advances which Entomology has made during the nine years since the second edition appeared.

BIG PROBLEMS ON LITTLE SHOULDERS, CARL and MILDRED PAUL RENZ; *The Macmillan Co., 1935. $1.50.*

The French maxim "A baby is an angel whose wings decrease as his legs increase" introduces a charming little book which your newly married or soon-to-be-blessed-evented friends will thank you for. Read it yourself, first.

BOTANY, PRINCIPLES AND PROBLEMS, EDMUND W. SINNOTT; *McGraw-Hill Book Company, Inc., New York, 1935. $3.50.*

The addition of forty more aptly chosen illustrations to a textbook which has already made for itself an enviable reputation would be sufficient justification for a new edition in six years. Dr. Sinnott has gone farther, however, not only thoroughly modernizing his book, but especially in taking the botanical bull by the horns and recasting the whole classification of the vascular plants. This fresh attack on old problems should make new friends for a forward looking text.

COLLEGE BIOLOGY, Ulric A. Hauber; *Edwards Brothers, Ann Arbor, 1934. $1.50.*

The work of a priest who received his doctorate in biology from a mid-western state university, this first part of a college text has been photo-printed by the well-known Michigan firm. Not the least interesting part is the profusion of remarkably satisfactory illustrations. Many texts printed in the usual fashion are not nearly so successful. The text matter is well arranged, with many sections not usually found, e. g., the review topics, the terminologies, etc., proving that the author is a practical teacher, not a theorist.

COMPARATIVE PSYCHOLOGY, Edward L. Thorndike and eleven others; *Prentice-Hall, Inc., New York, 1934.*

Fifteen monographs by twelve psychological competent research workers in the various correlated fields of their science. Authoritative.

CREATURES GREAT AND SMALL, H. Rossiter Synder; *Loring & Mussey, New York, 1935. $2.00.*

If you are an amateur photographer or a lover of animals, or both, you will pick up this gorgeous picture-book again and again to revel in the most unusual collection of 75 rotogravure reproductions of animal portraiture yet to cross our desk. See it and be convinced.

DAYLILIES, A. B. Stout; *Macmillan, New York, 1934. $3.00.*

The director of the laboratories of the New York Botanical Garden sums up the knowledge and experience of years in the care and development of new species of those very common escapes from cultivation, the genus "Hemerocallis." 36 pages of illustrations, many of them in color.

DESERTS ON THE MARCH, Paul B. Sears; *University of Oklahoma Press, Norman, 1935. $2.50.*

Here is a book we should like to see awarded the laurel as the finest bit of non-fiction published this year. We are not praising because it was written by Dr. Sears, formerly national chancellor of Phi Sigma. Its clear, firm grasp on some of the besetting stupidities of modern life are its own best advertisement. Here is the refreshing spectacle of a biologist philosophising within his own legitimate field, and, as a result, achieving the most unique scientific essay of the year.

THE EMPIRE OF THE SNAKES, F. G. Carnochan and H. C. Adamson; *Frederick A. Stokes Co., New York, 1935. $3.00.*

This new edition is fully illustrated, thereby proportionately increasing the fascination of an already fascinating narrative. The late Theodore Roosevelt would have pronounced this a "Bully" book. We agree with the much-traveled Teddy. Carnochan's experiment with kingoliolo, the "Root of Living Death," reaches a height that makes most of our travel-magazine yarns insipid balderdash by comparison,—and it is evidently true!

ESSENTIALS OF TISSUE CULTURE TECHNIQUE, Gladys Cameron; *Farrar & Rinehart, New York, 1935. $3.00.*

The importance of tissue culture among the newer techniques of biological research makes this publication of really more importance than many more imposing books issued on older and better established procedures this year.

EVOLUTION OF FOLIAR TYPES, DWARF SHOOTS AND CONE SCALES OF PINUS, C. C. Doak; *University of Illinois Press, Urbana, 1935. $1.50.*

The third in the series of Illinois Biological Monographs published under the auspices of the graduate school of the university. Excellently gotten up, a credit to the graduate school and to the editorial staff.

EXPERIMENTAL PHYSIOLOGY, M. B. VISSCHER and PAUL W. SMITH; *Lea & Febiger, Philadelphia, 1935. $3.25.*

113 intelligently planned and still more intelligently outlined experiments in animal physiology. Handy both for class and reference use in the laboratory.

FRONTIER FOLKWAYS, JAMES G. LEYBURN; *Yale University Press, New Haven, 1935. $3.00.*

Ex professo intended for the sociologist, this remarkable volume has real value for the natural scientist and a particular appeal to the biologist. Taking for a text, "Adaptation to environment is the primary law of life," the author makes a detailed study of eight frontiers (the laboratories of the social scientist), of four widely different types, and, after careful analysis, presents some gratifyingly definite—albeit somewhat dogmatic—conclusions. To a teacher anxious to provide himself with new illustrative material to explain or interest his classes in Biology 1, and to anyone willing to expand his vision, this reviewer without reserve or qualification recommends this book, delightfully written with charming tolerance and unobtrusive humor, and none the less a scientific work for all it is a literary treat.

GENERAL BIOLOGY, HENRY R. BARROWS; *Farrar and Rinehart, Inc., New York, 1935. $3.50.*

This text for a year course in freshman biology is somewhat different from the usual book of its type. We are not sure whether we like it or not. For one of these survey courses becoming so popular it might be an almost ideal text. It begins at the beginning of things with the spiral nebulae, runs through the chemical and physical nature of matter and protoplasm, then differentiates plant and animal tissues, and outlines the taxonomy of the two groups. Plants are covered in twenty pages, animals in one hundred. The rest of the book, about four hundred pages, is devoted to the major biological problems of nutrition, response, endocrinology, reproduction, heredity, evolution and development. If we must give a year course in general biology, this text comes closer to the ideal than many another.

GENETICS, H. S. JENNINGS; *W. W. Norton & Co., New York, 1935. $4.00.*

Bringing the available information on genetics down to date in one readable volume is successfully achieved in this latest of the works of Dr. H. S. Jennings of Johns Hopkins University. Valuable for general knowledge, but due to the absence of specifically annotated statements, of dubious help to the advanced student.

GENETICS OF GARDEN PLANTS, M. B. CRANE and W. J. C. LAWRENCE; *Macmillan, New York, 1934. $3.00.*

A valuable addition to our knowledge of plant genetics by two associates of the great English pioneer in the field, William Bateson. Plant geneticists and cytologists will want this book.

THE GEOGRAPHIC PATTERN OF MANKIND, JOHN E. POMFRET, *New York. D. Appleton-Century Co., 1935. pp. xv, 442. Price, $2.25.*

The thesis of this ambitious attempt to present "the physical stage upon which man works",—variously phrased and frequently reiterated,—is this: "Geographical factors impose certain broad limitations upon the manner of living of any social group, and in a more subtle fashion geography may condition, in a thousand instances, the general culture pattern" (p. 300). Elaborately illustrated and leaving nothing to be desired in form as a text to provide a background for social science students, the same cannot be said as to its content for one would think that social science teachers as well as this biologist might well wish that the author had spent less time on the "cultural landscape" and more on the "natural landscape", leaving at least the more obvious relations between the two either to the reader or the teacher. Despite this criticism, however, recent valuable contributions in the increasingly important field of anthropogeography will be more intelligible to the student who has made himself familiar with this book which is a good introduction to a fascinating field of barely touched scientific inquiry.

THE FAMILIES OF THE FLOWERING PLANTS, MONOCOTYLEDONS, J. HUTCHINSON; *Macmillan, New York, 1934. $6.00.*

This is the long awaited second volume of Dr. Hutchinson's important taxonomic work on the spermatophytes. Not every botanist will agree with the author's ideas, but "du choc des opinion jaillel la verite," and even botanists need a few powerful heretics to make them keep the faith!

HEREDITY AND THE ASCENT OF MAN, C. C. HURST; *Macmillan, New York, 1935. $1.50.*

A popular epitome of recent work in genetics, written with all the thoroughness of a Cantabridgian, and with the author's usual flair for philosophizing unsuppressed.

HOLIDAY SHORE, EDITH M. PATCH and CARROL L. FENTON; *Macmillan Co., New York, 1935. $2.00.*

If this particular number is a characteristic sample of Edith M. Patch's work in the entire Holiday series of book put out by Macmillan, biologically minded parents who are looking for Christmas gift books for young (hoped to be) biologists need look no farther. They have found that which they were seeking. We fail to imagine a youngster beyond the toddling stage who will not thrill to this work, and whose next summer at the shore will not be immeasurably more profitable for it. Take our advice, get a copy for inquisitive Jack or Jill this Christmas. We're betting you don't put it down until YOU have finished it.

HORTUS, L. H. BAILEY and E. Z. BAILEY; *Macmillan, New York, 1935.*

The newly revised edition of this very practical work should be in every library. It is more complete than most taxonomic works, yet not as bulky and unwieldly as the four (or now three) volume edition of the same author's Cyclopedia of Horticulture. Of course the latter work contains a large amount of horticultural information lacking in Hortus which is confined to the varieties of flower and kitchen garden plants grown in the country.

IN FIELD AND GARDEN, CLYDE FISHER and MARION LANGHAM; *Noble & Noble, New York, 1935.*

Book four of the Nature Science Series of classroom texts is devoted to the field and garden plants. Interestingly presented text, many colored sketches, suggested activities, etc., should make it excellent school material, and, where not used as such, a good gift book to keep young biologists busy.

INTRODUCTION TO HUMAN ANATOMY, CLYDE MARSHALL; *W. N. Saunders Co., Philadelphia, 1935. $2.50.*

This text is one of the most complete human anatomies we have yet seen, yet the book is small, only 385 pages in length, with an abundance of good illustrations, some in color.

INVERTEBRATA, L. A. BORRADAILE and F. A. POTTS; *Macmillan, New York, 1935. $4.00.*

That a second edition of Borradaile's thoroughly scientific manual of the invertebrates became necessary within three years of its first publication, is ample evidence of the usefulness as well as the practicality of the book. Its low price for so large a work is also encouraging.

LABORATORY MANUAL OF GENERAL BOTANY, E. FISK and R. ADDOMS; *Macmillan, New York, 1935. $1.00.*

A revision of the earlier work published by the same authors, to bring the manual more into line with the latest edition of the so-called "Wisconsin Text" by Smith, Overton and others. This laboratory manual has had wide use in the past. Its revision will keep it popular.

THE LICHEN FLORA OF THE UNITED STATES, BRUCE FINK; *University of Michigan Press, Ann Arbor, 1935. $4.00.*

The first exhaustive treatment of the lichens to originate in the U. S. A. this last opus of the late Dr. Fink will fill a long felt want in the botanical reference shelves of our college and scientific libraries.

LIFE BEGINS, MORRIS BRAUDE; *Argus Books, Chicago, 1935. $2.00.*

Childbirth in lore and literature tastefully presented for the obstetrically minded, by the professor of psychiatry of Rush Medical college.

LIMNOLOGY, PAUL S. WELCH; *McGraw-Hill Book Co., New York, 1935. $5.00.*

McGraw-Hill again rings the bell with the publication of this text on the ecology of inland waters, which has come to be called "Limnology" as opposed to "Oceanography." Fifty-five pages of bibliography alone attest to the author's familiarity with his field.

THE MAGDALENIAN SKELETON FROM CAP-BLANC IN THE FIELD MUSEUM OF NATURAL HISTORY, GERHARDT VON BONIN; *University of Illinois Press, Urbana, 1935. $1.00.*

This interesting monograph is another in the series published by the graduate school of the University of Illinois. It bodes well for the future that the medical and dental faculties are sponsoring this paleontological research.

MANUAL OF SOUTHERN CALIFORNIA BOTANY, PHILIP A. MUNZ; *J. W. Stacey, Inc., San Francisco, 1935. $5.00.*

What must have been an obvious need in the ecologically specialized Californian plant sciences has been adequately supplied in this taxonomic handbook.

MASTERY TESTS IN BIOLOGY, G. W. HUNTER and L. W. KITCH; *American Book Co., New York, 1934.*

"A test a day will keep the flunks away," in eighteen weekly sets for high school students in biology, especially those who use the senior author's textbooks.

MEDICAL GREEK AND LATIN AT A GLANCE, WALTER R. AGARD; *Edwards Brothers, Inc., Ann Arbor, 1935. $1.10.*

Simplified Greek word-construction for the scientifically minded, with a plentiful supply of Latin prefixes and suffixes. Invaluable for an intelligent grasp on modern medical, and biological, terminology.

THE MEDICAL MAN AND THE WITCH DURING THE RENAISSANCE, GREGORY ZILBOORG; *The Johns Hopkins Press, Baltimore, 1935. $2.50.*

The story of the rise of modern pyschiatry in the work of Johann Weyer, student of Cornelius Agrippa, during the middle of the 16th century. The account is accurate, fair and always interesting.

THE MICROSCOPIC ANATOMY OF VERTEBRATES, GEORGE G. SCOTT and JAMES I. KENDALL; *Lea & Febiger, Philadelphia, 1935. $3.75.*

Here is an invaluable adjunct to every course in comparative anatomy, especially that of the vertebrates. Ever since the medical schools of our university systems annexed their respective departments of zoology, microscopic anatomy and histology have been almost exclusively devoted to human tissue studies. Here is a book which breaks with the vogue. It was badly needed.

NATURAL HISTORY PICTURES, GAYLE PICKWELL; *Publishers Distributing Service, Unit I, Animal Studies, Los Angeles, 1934, $6.00; Unit II, Desert Studies, Los Angeles, 1934, $6.00; Unit III, Bird Studies, Los Angeles, 1935, $6.00.*

Three packages of about 50 8x10 inch photographs which constitute an attractive ecological series on the three subjects listed. Those who believe in visual education and have either small enough classes, or a reflecting type of projection apparatus will find these well chosen and frequently rare photographs of great assistance.

ON BEING HUMAN, GERALD VANN; *Sheed & Ward, New York, 1934. $1.00.*

An interesting commentary on the works of Aldous Huxley by a Christian. Will be honest drivel to those who oppose the application of religious principles to philosophical thinking,—interesting, if not acceptable to others.

OUR AMERICAN MAPLES, MARGARET CURTIN FINLAY; *The Author, Allenhurst, N. J., 1934. $3.00.*

Fourteen species of American and some foreign maples grown in this country are not only classified, but excellently illustrated by large, clear, full page reproductions of the characteristic tree trunks, winter appearance, spring and summer habit, floral branches, leaves and fruit. The owner of this little book can't go wrong on his maples.

PACEMAKERS IN RELATION TO ASPECTS OF BEHAVIOR, HUDSON HOAGLAND; *Macmillan, New York, 1935. $3.00.*

"Certain examples of the behavior of protoplasmic systems are selected and discussed in detail to illustrate how physicochemical master reactions, involved in the maintenance of the steady state, may determine as pacemakers the velocities of complex behavioral events."

PARADE OF THE ANIMAL KINGDOM, ROBERT HEGNER; *Macmillan, New York, 1935. $5.00.*

Absolutely at the top of the "What-to-give-to-Jack-this-Christmas" list stands Dr. Hegner's new book. Not that it is a child's book, however. It will interest if not fascinate any grown up. The vagaries of Nature are so many that young folk do not have to be brought up on animal fairy stories any longer. It is to be hoped that this book will become a sort of Natural History bible to the future hordes of childrens' storybook writers, and to the stooges who prepare copy for radio programs. In the hands of zoology teachers it should raise the human interest level of their lectures immeasurably.

PARENT AND CHILD, E. SCHMIEDLER and M. R. MCDONOUGH; *D. Appleton-Century Company, New York, 1934. $2.25.*

Child raising, parental responsibilities, and home possibilities on a high level are the ideals proposed in this timely book. Behaviorists will not like this book,—but they have so many of their own to like.

THE PHYSICK GARDEN, EDITH G. WHEELWRIGHT; *Houghton Mifflin Company, New York, 1935. $3.00.*

There is a fascination about the old herbals, forerunners of modern systems of plant classification. A similar fascination attaches itself to the old world medical garden plants so painstakingly, yet charmingly, described in "The Physick Garden."

THE PLANT KINGDOM, WILLIAM H. BROWN; *Ginn and Company, Boston, 1935.*

Year by year college botany texts become more and more ample. Just why, is hard to say. Unquestionably the available botanical facts are many, but whether college freshmen are capable of assimilating the all is a highly dubious proposition. Perhaps botany text authors want to please all sorts of teachers, and put everything possible into their books on the theory that the professor in each case will stress the really (to him) important facts. With 869 well printed and illustrated pages this book easily leads the year's botany textbook marathon.

PLANT LIFE, D. B. SWINGLE; *D. Van Nostrand Co., New York, 1935.*

A wealth of new illustrations, and a happy absence of many of the much-copied figures from other texts, as well as suggestive lists of review questions at the end of each chapter characterize this new Swingle text. It follows the more or less traditional arrangement in treating first of the structure, function, and relationships of plants, and then the different classes.

PRACTICAL COMPARATIVE EMBRYOLOGY, A. RICHARDS and A. I. ORTENBURGER; *John S. Swift Co., St. Louis, 1935. $1.45.*

One of the most intelligently planned laboratory and classroom texts that has yet come onto the scholastic market. While the spiral binding is bulky, it is perhaps just as well that this type of student record is not too permanent. Once final examinations are over, the less there is to dispose of the better for most American college people.

PRIMITIVE LAND PLANTS, F. O. BOWER; *Macmillan, New York, 1935. $8.00.*

Primary organization of land living plants as illuminated by the fossil remains, is the theme of this new text by one of Britain's foremost elder botanists. It is full of original suggestions as to the origin of our land flora. Based on the piverworts, mosses, lycopods and ferns, it can in no sense be termed a revision of the author's earlier "Origin of a Land Flora," but is rather, the rounding out and completion of a life's work in this interesting field.

PRIMITIVES AND THE SUPERNATURAL, LUCIEN LEVY-BRUHL; *E. P. Dutton & Co., New York, 1935. $5.00.*

Lilian Clare's lucid translation of this authoritative work on primitive beliefs is a landmark in modern anthropology. Levy-Bruhl's use of the collected reports of so many missionaries opens almost too late a fertile source of reliable data on primitive cultures. It has taken some anthropologists a long time to overcome their environmental prejudices to using information from sources so unscientific in the popular mind.

PRINCIPLES OF INSECT MORPHOLOGY, R. E. SNODGRASS; *McGraw-Hill, New York, 1935. $6.00.*

The student who has struggled through the intricacies of an insect's "innards" will rejoice to find this valuable book on his library or laboratory shelves. There will be wider, if less exuberant, rejoicing among the zoology and especially entomology laboratory instructors and assistants. From which you will gather that the book is eminently worth while.

PROBLEMS IN BIOLOGY, GEORGE W. HUNTER; *American Book Co., New York, 1935.*

The latest production of one of America's pioneer high school biology teachers should come as a distinct help to those instructors in high school who need additional texts to guide their classroom procedure. Dr. Hunter has been through the mill so long that his technique is valuable, and his approach practical.

PROBLEMS IN EXPERIMENTAL EMBRYOLOGY, JULIAN S. HUXLEY; *Oxford University Press, New York, 1935. $0.35.*

The thirty-sixth Robert Boyle lecture before the Oxford University Junior Scientific club, last year, is an interesting, brief, yet clear account in popular style,—there are no references,—of the chief steps in the development of our modern experimental embryology.

PSYCHOLOGY AND LIFE, LESLIE D. WEATHERHEAD; *Abingdon Press, New York, 1935. $2.00.*

This is a book by an English clergyman, d.d. (denomination doubtful), who has sincerely and earnestly tried to make heads and tails out of religion, psychology and the science of life. He does a surprisingly good job of it. Evidently being the sort of person his friends are proud to call "Friend." Hard-boiled opponents of all religious manifestation and soft-boiled students who think they ought to join the opposition won't like this book.

RESEARCH, T. A. BOYD; *D. Appleton-Century, New York, 1935. $2.50.*

A very interesting eulogy of research "the pathfinder of science and industry," written by one who speaks like an Important Person in the research Division of General Motors, and who likes to bring into his pages many other oracular sayings by Important Persons in other industries. Science should be thankful. (No, the car which we do not possess is Not a General Motors product.)

SCENES FROM THE MESOZOIC, CLARENCE DAY; *Yale University Press, New Haven, 1935. $2.50.*

Sketches and verses prehistorically ribald, which formerly appeared in "The New Yorker." Those who liked them then will like them now.

SCIENCE TEACHING, G. W. HUNTER; *American Book Co., New York, 1934.*

This manual of teaching methods at junior and senior high school levels comes from one of the best fitted by experience of all our high school teaching profession. The book is probably designed for teacher-college class room technique, but will prove valuable to anyone who gets a teaching assignment.

THE SEARCH FOR TRUTH, ERIC T. BELL; *Williams and Wilkins Co., Baltimore, 1934. $5.00.*

Under the pseudonym of "John Taine" the author of this book recently produced a delightful romance of prehistoric time which he dubbed "fantascience." He should have stuck to his last. This much praised volume left us cold. Feelings of sympathy, and all that sort of thing, you know,—as if we had reread "Don Quixote," and rather sympathized with the dotty old knight and his windmill onslaught. Ho hum! Next?

SCIENCE AND THE SUPERNATURAL, ARNOLD LUNN and J. B. S. HALDANE; *Sheed & Ward, New York, 1935. $3.00.*

Here, my friends, is a REAL book. Two of the most polished, deadly duellists in the intellectual world level at each other, not bludgeons, nor broadswords, nor even pistols,—but the deadlier nether weapons of ideas, arguments, theories and facts. Needless to say each duellist is worthy of his opponent. Both have attained eminence in their respective fields, and the book is the "hottest" debunker of scholarly "Blah" that has appeared in years. You cannot read it without taking sides,—and then wondering why you acted as you did.

THE SOYA BEAN, ELIZABETH BOWDIDGE; *Oxford University Press, New York, 1935. $2.00.*

This short, illustrated book summarizes the latest research and descriptive papers on the soy bean as published in many countries, with the idea of making the English farmer soybean-conscious.

SOUTHEAST OF ZAMBOANGA, VIC HURLEY; *E. P. Dutton & Co., New York, 1935. $3.00.*

Not many college men would want to experience the incidents narrated here, and not all would want, or be able, to dedicate the story of their experience as Hurley does, to their mothers. Nevertheless, this is a man-sized story.

STRUCTURE AND REPRODUCTION OF THE ALGAE, F. E. FRITSCH; *Macmillan, New York, 1935. $8.00.*

This is Volume I of a two volume work on the Algae, and concerns itself chiefly with the Chlorophyceae, the Xanthophyceae, the Chrysophyceae and the Bacillariophyceae, as well as the heterogeneous groups of green to yellowish forms which would not properly come under the headings of Blue-Green, Red or Brown Algae. The name of Dr. Fritsch is all that the book needs to make its demand on the respectful attention of every botanist. Unquestionably this is a book for every college library, although most botanists with cryptogamic leanings will want it too.

SYMPOSIA COMMEMORATING SIX DECADES OF THE MODERN ERA IN BOTANICAL SCIENCE, IOWA STATE COLLEGE JOURNAL OF SCIENCE; *Iowa State College, Ames, 1935.*

Reprints from the Iowa State College Journal of Science, grouped under three main headings,—Teaching General Botany, Erosion Prevention Capacity of Plant Cover, and Applied Botanical Research on Maize.

SYMPOSIA ON QUANTITATIVE BIOLOGY, COLD SPRING HARBOR BIOLOGICAL LABORATORY; *Biological Laboratory, Cold Spring Harbor, L. I., 1934.*

The annual laboratory symposia in 1933 were devoted to the subject of growth. The eminence of those who presented the papers, and those who lead the discussions on them are sufficient argument both for the importance of the papers and the validity of their research.

A TERMINOLOGY OF OPERATIONS OF THE UNIVERSITY OF CHICAGO CLINICS, H. P. JENKINS; *University of Chicago Press, Chicago, 1935. $1.00.*

A handy hospital manual for recording librarians in their duties listing various types of operations performed.

TEXTBOOK OF GENERAL BOTANY, R. M. HOLMAN and W. W. ROBBINS; *John Wiley & Sons, New York, 1934. $4.00.*

There are three or four general botanical texts whose excellencies have brought them to occupy the leading places in our courses. The Holman and Robbins text is one of these. Originally published in 1924, reedited in '27 and now in its third edition it has so many good points to commend it that to attempt to enumerate them would be akin to "carrying coals to Newcastle."

TEXTBOOK OF GENERAL BOTANY, G. M. SMITH, J. B. OVERTON, E. M. GILBERT, R. H. DENNISTON, G. S. BRYAN, and C. E. ALLEN; *Macmillan, New York, 1935. $3.50.*

This is a large $3.50 worth of Botany, either as a textbook, or as a reference work. The third edition marks several differences from earlier issues. Buds, nuclear division, the algae, liverworts and inheritance have come in for some, if not considerable revision. While the original edition contained many revolutionary departures from established procedures, not all were favorably received by the teaching profession, as for example, the anglicizing of Latin and Greek terms, which has been discarded in this third edition. The so-called "Wisconsin Text" in its revision should keep all the friends it originally made, and make a lot of new ones.

TEXTBOOK OF HISTOLOGY, A. A. MAXIMOW and W. BLOOM; *W. B. Saunders Co., Philadelphia, 1934. $7.00.*

This second edition of a very popular histological text will help to spread its use considerably as the junior author has profited by suggestions received on the first edition.

TEXTBOOK OF MYCOLOGY, E. A. BESSEY; *P. Blakiston's Son & Co., Philadelphia, 1935. $4.00.*

Whenever a successful teacher sets out to hand down the facts in his field in ways that years of experience have proved valuable, the resulting textbook deserves respectful attention. Of such is this new text on mycology by Dr. Bessey of Michigan State College.

TRANSLOCATION OF SOLUTES IN PLANTS, O. F. CURTIS; *McGraw-Hill Book Co., New York, 1935. $3.00.*

These McGraw-Hill people are really succeeding in their ambitious aim of presenting new texts on the newer fields that are opening in the agricultural and botanical sciences. The Curtis book on translocation is no exception to their established procedure. It summarizes so much that has been available only in widely scattered references that it will probably find its way to nearly every botany teacher's library.

TROPICAL FISHES AND HOME AQUARIA, ALFRED MORGAN; *Charles Scribner's Sons, New York, 1935. $2.50.*

Bird lovers are not the only naturalists who are rejoicing over interesting new books in the fields of their hobbies. Tropical fish fanciers who are looking for a comprehensive handbook covering not only the various types of fish suitable for the home aquarium but also the best methods and equipment for raising them.

THE VAMPIRE BAT, R. L. DITMARS and A. M. GREENHALL; *New York Zoological Society, New York, 1935.*

An intelligent treatment of an interesting animal group which has given rise to more superstitious horrors than any other in all nature. Read Bram Stoker's "Dracula" if you don't believe it.

WEBSTER'S NEW INTERNATIONAL DICTIONARY, W. A. NEILSON, Editor; *G. C. Merriam Co., Springfield, Mass., 1935. $20.00 to $35.00.*

The second unabridged edition of Webster's International Dictionary needs no comment more favorable than to point out the enviable care which was taken to insure accuracy in its biological terminology. The only serious adherence to a more or less dead tradition is found in the definition of the word "mitosis" where the outmoded term "spireme" still holds place.

WEEDS, W. C. MUENSCHER; *Macmillan, New York, 1935. $6.00.*

Skillfully distinguishing the weeds as to their nature, taxonomy, and above all, control, Muenscher has done agriculture and its more intense sister-avocation, horticulture a distinct service. After all, perhaps every weed he lists could be found in Gray or any other good taxonomy. How to control such plant pests is a bigger and more important question, at last happily offered a solution.

WILD BIRDS AT HOME, F. H. HERRICK; *D. Appleton-Century Co., New York, 1935. $4.00.*

The "blurb" on the jacket of this book announces that it is "lavishly illustrated". For once the statement does not mislead. The illustrations are valuable ecological data in addition to the light they throw on the text. All bird lovers will want this book.

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When a woman marries again, it is because she detested her first husband; when a man marries again, it is because he adored his first wife. Women try their luck; men risk theirs.—*Oscar Wilde.*

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